Test Report: HBG-100-60

100W Single Output Switching Power Supply

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection 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℃	V1： 65 mVp-p (Max)	P
2	CONSTANT CURRENT REGION	CH1： 36 V ~ 60 V	I/P： 230VAC O/P：CV MODE Ta：25℃	O/P= 36V： 1.609 A O/P= 60V： 1.611 A	P
3	CURRENT ADJUST RANGE	CH1: 1.0 A ~ 1.6 A	I/P： 230VAC I/P： 115VAC O/P：CV MODE Ta：25℃	0.944 A ~ 1.685 A /230VAC 0.947 A ~ 1.688 A /115VAC	P
4	OUTPUT VOLTAGE TOLERANCE	V1： 1 %~ -1 % (Max)	I/P：100 VAC / 305 VAC O/P：FULL/ MIN LOAD Ta：25℃	V1： 0.687 %~ -0.065 %	P
5	LINE REGULATION	V1： 0.5 %~ -0.5 % (Max)	I/P：100 VAC ~ 305 VAC O/P：FULL LOAD Ta：25℃	V1： 0 %~ 0 %	P
6	LOAD REGULATION	V1： 1 %~ -1 % (Max)	I/P： 230 VAC O/P：FULL ~MIN LOAD Ta：25℃	V1： 0.030 %~ -0.061 %	P
7	SET UP TIME	230VAC： 1000 ms (Max) 115VAC： 2000 ms(Max)	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 507 ms 115VAC/ 519 ms	P
8	RISE TIME	230VAC： 80 ms (Max) 115VAC： 80 ms (Max)	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 27.23 ms 115VAC/ 26.92 ms	P
9	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/ 71.05 ms 115VAC/ 32.20 ms	P
10	OVER/UNDERSHOOT TEST	< ±5%	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	TEST： <5 %	P
11	DYNAMIC LOAD	V1： 6000 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℃	(1) 598 mVp-p (2) 1300 mVp-p	P

12 DIMMER TEST

SPEC:

*Output constant current level can be adjusted through output cable by 1 ~ 10Vdc, PWM signal or resistor between ADJ1(+) and ADJ2(-).

*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℃

P

1	Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K
	Output current	0.170A	0.329A	0.489A	0.645A	0.806A	0.968A	1.130A	1.293A	1.458A	1.622A
	%	10.63%	20.56%	30.56%	40.31%	50.38%	60.50%	70.63%	80.81%	91.13%	101.4%
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
	Output current	0.175A	0.339A	0.497A	0.663A	0.826A	0.993A	1.154A	1.321A	1.467A	1.633A
	%	10.94%	21.19%	31.06%	41.44%	51.63%	62.06%	72.13%	82.56%	91.69%	102.1%
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Output current	0.188A	0.347A	0.508A	0.661A	0.822A	0.981A	1.141A	1.302A	1.462A	1.607A
	%	11.75%	21.69%	31.75%	41.31%	51.38%	61.31%	71.31%	81.38%	91.38%	100.4%

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	100VAC~305 VAC	I/P：TESTING O/P：FULL LOAD Ta：25℃	87 V~305V	P
			I/P： LOW-LINE-3V=97 V 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 ~ 305 VAC O/P：FULL~MIN LOAD Ta：25℃	TEST： OK	P
3	POWER FACTOR	0.96 / 230 VAC(TYP) 0.96 / 115 VAC(TYP) 0.94 / 277 VAC(TYP)	I/P： 230 VAC I/P： 115 VAC I/P： 277 VAC O/P：FULL LOAD Ta：25℃	PF= 0.986 / 100% PF= 0.996 / 100% PF= 0.976 / 100%	P
4	EFFICIENCY	91.5% (TYP)	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	91.94 %	P
5	INPUT CURRENT	230V/ 0.5 A (TYP) 115V/ 0.99 A (TYP) 277V/ 0.45 A (TYP)	I/P： 230 VAC I/P： 115 VAC I/P： 277 VAC O/P：FULL LOAD Ta：25℃	I = 0.447 A/ 230 VAC I = 0.937 A/ 115 VAC I = 0.391 A/ 277 VAC	P
6	INRUSH CURRENT	230V/ 60 A (TYP) COLD START	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I = 55.24 A/ 230 VAC	P
7	LEAKAGE CURRENT	< 0.75 mA / 277 VAC	I/P： 277 VAC O/P：Min LOAD Ta：25℃	L-CASE： 0.5889 mA N-CASE： 0.5851 mA	P

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	95 % ~ 108 %	I/P： 230 VAC I/P： 115 VAC O/P：TESTING Ta：25℃	100.33 %/ 230 VAC 100.56 %/ 115 VAC Constant current limiting, recovers automatically after fault condition is removed.	P
2	OVER VOLTAGE PROTECTION	CH1： 65 V ~ 75 V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	69.1 V/ 230 VAC 69.1 V/ 115 VAC Shut down o/p voltage, re-power on to recover	P
3	OVER TEMPERATURE PROTECTION	SPEC： RTH2： 95± 10℃ O.T.P. NO DAMAGE	I/P： 230 VAC O/P：FULL LOAD	O.T.P. Active Shut down o/p voltage, re-power on to recover	P
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P： 305 VAC O/P：FULL LOAD Ta：25℃	NO DAMAGE Hiccup mode, recovers automatically after fault condition is removed.	P

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated： 2SK3677: 700V/12A	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2) Output Short (3)Full load continue Ta：25℃	(1) 600 V (2) 462 V (3) 598 V	P
2	Diode Peak Voltage	Q101 Rated： STTH2003CT: 300V/20A	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(1) 234 V (2) 177 V (3) 233 V	P
3	Input Capacitor Voltage	C5 Rated： 82u/450V 105℃ 18*30 CST	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 444 V (2) 440 V (3) 436 V	P
4	Control IC Voltage Test	U 1 Rated： TEA1752T: 38V (MAX)	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 22.2 V (2) 22.2 V (3) 22.2 V	P
5	Power Transistor (D to S) or (C to E) Peak Voltage	Q2 Rated： TK10A60D :600V/11A	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2) Output Short (3)Full load continue Ta：25℃	(1) 454 V (2) 438 V (3) 448 V	P

■ SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P： 3.75 KVAC/min I/P-FG： 1.88 KVAC/min O/P-FG： 0.5 KVAC/min	I/P-O/P： 4 KVAC/min I/P-FG： 2.26 KVAC/min O/P-FG： 0.6 KVAC/min Ta：25℃	I/P-O/P： 3.831 mA I/P-FG： 3.803 mA O/P-FG： 3.084 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℃/70%RH	I/P-O/P： >9999 MΩ I/P-FG： >9999 MΩ O/P-FG： >9999 MΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta：25℃ / 70%RH	18 mΩ	P

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS C	I/P:220VAC/230VAC/240VAC50HZ O/P:100%,75%,60%LOAD Ta:25℃	PASS	P
2	CONDUCTION	EN55015	I/P: 230 VAC (50HZ)/115V[60HZ] O/P:FULL/65% LOAD Ta:25℃	PASS Test by certified Lab	P
3	RADIATION	EN55015	I/P: 230 VAC (50HZ)/115V[60HZ] O/P: FULL/65% LOAD Ta:25℃	PASS Test by certified Lab	P
4	E.S.D	EN61000-4-2 LIGHT 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 LIGHT INDUSTRY INPUT: 1KV	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:4KKV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A	P
7	Test by certified Lab & Test Report Prepare				

■ RELIABILITY TEST

ENVIRONMENT 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： HBG-100-48
1. ROOM AMBIENT BURN-IN：2.5 HRS
I/P： 230VAC O/P： 95% LOAD Ta=33.4 ℃
2. HIGH AMBIENT BURN-IN：3.5 HRS
I/P： 230VAC O/P： 95% LOAD Ta=63.2 ℃
<table>
<tr><th>NO</th><th>Position</th><th>P/N</th><th>ROOM AMBIENT Ta= 33.4 ℃</th><th>HIGH AMBIENT Ta= 63.2 ℃</th></tr>
<tr><td>1</td><td>LF1</td><td>TR990-R2</td><td>54.3℃</td><td>84.5℃</td></tr>
<tr><td>2</td><td>LF2</td><td>TR6098-R1</td><td>56.4℃</td><td>85.7℃</td></tr>
<tr><td>3</td><td>BD1</td><td>UD4KB80</td><td>60.0℃</td><td>90.1℃</td></tr>
<tr><td>4</td><td>C5</td><td>82u/450V 18*30 CST</td><td>59.7℃</td><td>89.1℃</td></tr>
<tr><td>5</td><td>C11</td><td>C/MPE 564/450V</td><td>56.1℃</td><td>86.7℃</td></tr>
<tr><td>6</td><td>L1</td><td>TR995-R1</td><td>57.8℃</td><td>88.8℃</td></tr>
<tr><td>7</td><td>L3</td><td>TF-6519</td><td>59.0℃</td><td>88.2℃</td></tr>
<tr><td>8</td><td>D6</td><td>MUR460</td><td>61.8℃</td><td>91.1℃</td></tr>
<tr><td>9</td><td>Q2</td><td>TK10A60D</td><td>63.0℃</td><td>92.9℃</td></tr>
<tr><td>10</td><td>U1</td><td>TEA1752T</td><td>61.5℃</td><td>91.5℃</td></tr>
<tr><td>11</td><td>C22</td><td>C/E 47uF/50V</td><td>58.2℃</td><td>88.5℃</td></tr>
<tr><td>12</td><td>Q1</td><td>2SK3677-01MR</td><td>66.7℃</td><td>96.4℃</td></tr>
<tr><td>13</td><td>T1</td><td>TF6517</td><td>71.3℃</td><td>100.5℃</td></tr>
<tr><td>14</td><td>Q1O1</td><td>STTH2003CT</td><td>63.8℃</td><td>93.7℃</td></tr>
<tr><td>15</td><td>C106</td><td>C/E 270u/63V</td><td>57.3℃</td><td>87.4℃</td></tr>
<tr><td>16</td><td>C107</td><td>C/E 270u/63V</td><td>57.8℃</td><td>87.7℃</td></tr>
<tr><td>17</td><td>L100</td><td>TR884-R5</td><td>56.2℃</td><td>86.2℃</td></tr>
</table></td><td>P</td></tr>
<tr><td>2</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 305VAC/100VAC
O/P： 95 % LOAD
Ta= -40/-25℃</td><td>TEST：OK</td><td>P</td></tr>
<tr><td>3</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 50 ℃
NO DAMAGE</td><td>I/P： 305 VAC
O/P：95% LOAD
Ta= 60 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td><td>P</td></tr>
<tr><td>4</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03 %(0~50℃)</td><td>I/P： 230 VAC
O/P：95% LOAD</td><td>± 0.007 %(0~50℃)</td><td>P</td></tr>
<tr><td>5</td><td>STORAGE TEMPERATURE TEST</td><td colspan="2">1. Thermal shock Temperature： -45℃~ +85℃
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>6</td><td>THERMAL SHOCK TEST</td><td colspan="2">1. Thermal shock Temperature： -30℃~ +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 AC ON/OFF TEST
turn on 58sec；turn off 2sec</td><td>OK</td><td>P</td></tr>
</table>

7	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
8	CAPACITOR LIFE CYCLE	HBG-100-48:SUPPOSE C107 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	(1) 580314 HRS (2) 50922 HRS (3) 62730 HRS	P
9	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE：300KHRS		P
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50,000 hours @ Tcase 70℃		P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2013/01/30	PRODUCT SAMPLE	PASS	ZOULF	HOWAY

2009/08/04 A50-F023