Test Report: HBG-240P-60

240W Constant Voltage + Constant Current LED Driver

■ 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	V1：350 mVp-p (Max)	I/P： 230VAC O/P：FULL LOAD Ta：25℃	V1： 150 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： 4.033 A O/P= 60V： 4.035 A	P
3	CURRENT ADJUST RANGE	CH1: 2.4A ~ 4.0 A	I/P： 230VAC I/P： 115VAC O/P：CV MODE Ta：25℃	1.515 A ~ 4.238 A /230VAC 1.517 A ~ 4.237 A /115VAC	P
4	OUTPUT VOLTAGE TOLERANCE	V1： 2 %~ -2 % (Max)	I/P：100 VAC / 305 VAC O/P：FULL/ MIN LOAD Ta：25℃	V1： 0.520 %~ -0.051 %	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： 0.5 %~ -0.5 % (Max)	I/P： 230 VAC O/P：FULL ~MIN LOAD Ta：25℃	V1： 0.042 %~ -0.051 %	P
7	SET UP TIME	230VAC： 500 ms (Max) 115VAC： 2500 ms(Max)	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 413 ms 115VAC/ 1477 ms	P
8	RISE TIME	230VAC： 120 ms (Max) 115VAC： 120 ms (Max)	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 38.90 ms 115VAC/ 39.44 ms	P
9	HOLD UP TIME	230VAC： 15 ms (TYP) 115VAC： 15 ms (TYP)	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 33.00 ms 115VAC/ 32.98 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) 368 mVp-p (2) 3760 mVp-p	P

12 DIMMING TEST （B-TYPE）

SPEC:

*Output constant current level can be adjusted by applying one of the three methodologies between DIM+ and DIM-： 1 ~ 10Vdc， or 10V PWM signal or resistance。

*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) Frequency range：100Hz~3KHz

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	0.266A	0.717A	1.164A	1.595A	2.028A	2.458A	2.895A	3.328A	3.755A	4.015A
	%	6.65%	17.93%	29.10%	39.88%	50.70%	61.45%	72.38%	83.20%	93.88%	100.4%
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
	Output current	0.243A	0.676A	1.109A	1.524A	1.929A	2.347A	2.803A	3.239A	3.672A	4.039A
	%	6.08%	16.90%	27.73%	38.10%	48.23%	58.68%	70.08%	80.98%	91.80%	101.0%
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Output current	0.278A	0.700A	1.126A	1.532A	1.941A	2.358A	2.777A	3.202A	3.622A	4.010A
	%	6.95%	17.5%	28.15%	38.30%	48.53%	58.95%	69.43%	80.05%	90.55%	100.3%

P

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	90VAC~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	0.94 / 230 VAC(TYP) 0.98 / 115 VAC(TYP) 0.9 / 277 VAC(TYP)	I/P： 230 VAC I/P： 115 VAC I/P： 277 VAC O/P：FULL LOAD Ta：25℃	PF= 0.970 / 230 VAC PF= 0.995 / 115 VAC PF= 0.940 / 277 VAC	P
4	EFFICIENCY	93.5% (TYP)	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	93.89 %	P
5	INPUT CURRENT	230V/ 1.4 A (TYP) 115V/ 2.8 A (TYP) 277V/ 1.2 A (TYP)	I/P： 230 VAC I/P： 115 VAC I/P： 277 VAC O/P：FULL LOAD Ta：25℃	I = 1.140 A/ 230 VAC I = 2.315 A/ 115 VAC I = 0.968 A/ 277 VAC	P
6	INRUSH CURRENT	230V/ 75 A (TYP) COLD START	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I = 56.81 A/ 230 VAC	P
7	LEAKAGE CURRENT	< 0.75 mA / 277 VAC	I/P： 277 VAC O/P：Min LOAD Ta：25℃	L-CASE： 0.3953 mA N-CASE： 0.3900 mA	P
8	TOTAL HARMONIC DISTORTION	Total harmonic distortion will be lower than 20% when output loading is 60% or higher at 115VAC/230VAC	I/P： 115VAC I/P： 230VAC O/P：60% LOAD	THD： 7.58 %/115VAC THD： 19.48 %/230VAC	P
		Total harmonic distortion will be lower than 20% when output loading is 75% or higher at 277VAC	I/P： 277VAC O/P：75% LOAD	THD： 19.97 %/277VAC	

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℃	100.88 %/ 230 VAC 100.78 %/ 115 VAC Constant current limiting ,recovers automatically after fault condition is removed	P
2	OVER VOLTAGE PROTECTION	CH1： 62 V ~ 85 V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	66.6 V/ 230 VAC 66.6 V/ 115 VAC Shut down and latch off o/p voltage, re-power on to recover	P
3	OVER TEMPERATURE PROTECTION	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： 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	Q3 Rated： 600V/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) 462 V (2) 460 V (3) 452 V	P
2	Diode Peak Voltage	Q101 Rated： 200V/ 30 A	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(1) 142 V (2) 19.3 V (3) 136 V	P
3	Input Capacitor Voltage	C5 Rated： 150u/450V	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) 446 V (2) 444 V (3) 444 V	P
4	Control IC Voltage Test	U70 Rated： 16V (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) 14.9 V (2) 14.9 V (3) 14.9 V	P
5	Power Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated： 600V/20.2A	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2) Output Short (3)Full load continue Ta：25℃	(1) 556 V (2) 500 V (3) 502 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： 2.0 KVAC/min O/P-FG： 0.5 KVAC/min	I/P-O/P： 4.2 KVAC/min I/P-FG： 2.4 KVAC/min O/P-FG： 0.6 KVAC/min Ta：25℃	I/P-O/P： 3.081 mA I/P-FG： 3.372 mA O/P-FG： 1.856 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

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- EARTH: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-240P-48
1. ROOM AMBIENT BURN-IN：2.5 HRS
I/P： 230VAC O/P： 95% LOAD Ta=34.7 ℃
2. HIGH AMBIENT BURN-IN：3.5 HRS
I/P： 230VAC O/P： 95% LOAD Ta=53.7 ℃

<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT
Ta= 34.7 ℃</th><th>HIGH AMBIENT
Ta= 53.7 ℃</th></tr>
<tr><td>1</td><td>LF2</td><td>58.4℃</td><td>77.1℃</td></tr>
<tr><td>2</td><td>BD1</td><td>80.4℃</td><td>101.0℃</td></tr>
<tr><td>3</td><td>C5</td><td>59.3℃</td><td>81.5℃</td></tr>
<tr><td>4</td><td>D2</td><td>62.2℃</td><td>85.7℃</td></tr>
<tr><td>5</td><td>L1</td><td>59.2℃</td><td>86.3℃</td></tr>
<tr><td>6</td><td>Q1</td><td>62.6℃</td><td>86.8℃</td></tr>
<tr><td>7</td><td>C39</td><td>56.1℃</td><td>76.8℃</td></tr>
<tr><td>8</td><td>U1</td><td>56.5℃</td><td>83.2℃</td></tr>
<tr><td>9</td><td>Q3</td><td>63.1℃</td><td>87.2℃</td></tr>
<tr><td>10</td><td>Q4</td><td>64.3℃</td><td>86.8℃</td></tr>
<tr><td>11</td><td>T1</td><td>78.5℃</td><td>98.6℃</td></tr>
<tr><td>12</td><td>Q101</td><td>81.8℃</td><td>102.4℃</td></tr>
<tr><td>13</td><td>Q102</td><td>82.3℃</td><td>99.8℃</td></tr>
<tr><td>14</td><td>C102</td><td>68.0℃</td><td>84.8℃</td></tr>
<tr><td>15</td><td>C105</td><td>56.7℃</td><td>79.9℃</td></tr>
<tr><td>16</td><td>LF100</td><td>55.3℃</td><td>76.4℃</td></tr>
<tr><td>17</td><td>TSW1</td><td>62.6℃</td><td>82.6℃</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= -45℃</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 45 ℃
NO DAMAGE</td><td>I/P： 305 VAC
O/P：95% LOAD
Ta= 45 ℃
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>±0.015 %(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>
</table>

6	THERMAL SHOCK TEST	1. Thermal shock Temperature： -45℃~ +50℃ 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	OK	P
7	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：72min in each axis (X.Y.Z) (6) Ta：25℃	TEST：OK	P
8	CAPACITOR LIFE CYCLE	HBG-240P-48: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=45 ℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta=45 ℃ LIFE TIME	(1) 377317 HRS (2) 109816 HRS (3) 112338 HRS	P
9	MTBF	Conducted by Parts Stress Analysis Prediction 175K hrs min. MIL-HDBK-217F (25℃)		P

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	ZHANGZJ/ZHOUB	SKY	LIUWY

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