



# Test Report: HBG-240P-36

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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 : 250 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 40 mVp-p (Max)	P
2	CONSTANT CURRENT REGION	CH1: 21.6V ~ 36V	I/P : 230VAC O/P : CV MODE Ta : 25°C	O/P= 21.6V : 6.575 A O/P= 36V : 6.727 A	P
3	CURRENT ADJUST RANGE	CH1: 4.0A ~ 6.7A	I/P : 230VAC I/P : 115VAC O/P : CV MODE Ta : 25°C	3.724 A ~ 6.865 A /230VAC 3.726 A ~ 6.857 A /115VAC	P
4	OUTPUT VOLTAGE TOLERANCE	V1 : 2%~ -2% (Max)	I/P : 100 VAC / 305 VAC O/P : FULL/ MIN LOAD Ta : 25°C	V1 : 0.100 %~ -0.120 %	P
5	LINE REGULATION	V1 : 0.5%~ -0.5% (Max)	I/P : 100 VAC ~ 305 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0. %~ -0.005 %	P
6	LOAD REGULATION	V1 : 0.5%~ -0.5% (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.100 %~ -0.120 %	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°C	230VAC/ 433 ms 115VAC/ 1623 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°C	230VAC/ 39.11 ms 115VAC/ 39.05 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°C	230VAC/ 33.53 ms 115VAC/ 32.51 ms	P
10	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	TEST : <5 %	P
11	DYNAMIC LOAD	V1 : 3600 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) 1940 mVp-p (2) 1930 mVp-p	P

12	DIMMING TEST (B-TYPE)	<p>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.</p> <p>*Reference resistance value for output current adjustment (Typical)</p> <table border="1"> <tr> <td>Resistance value</td> <td>10K</td> <td>20K</td> <td>30K</td> <td>40K</td> <td>50K</td> <td>60K</td> <td>70K</td> <td>80K</td> <td>90K</td> <td>100K</td> </tr> <tr> <td>Output current</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> </tr> </table> <p>*1 ~ 10V dimming function for output current adjustment (Typical)</p> <table border="1"> <tr> <td>Dimming value</td> <td>1V</td> <td>2V</td> <td>3V</td> <td>4V</td> <td>5V</td> <td>6V</td> <td>7V</td> <td>8V</td> <td>9V</td> <td>10V</td> </tr> <tr> <td>Output current</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> </tr> </table> <p>*10V PWM signal for output current adjustment (Typical) Frequency range : 100Hz~3KHz</p> <table border="1"> <tr> <td>Duty value</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> </tr> <tr> <td>Output current</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> </tr> </table>										Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
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		TEST RESULT: I/P : 230 VAC ;Ta : 25°C																																																																											
		1	Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K																																																																
			Output current	0.529A	1.223A	1.927A	2.627A	3.312A	3.961A	4.665A	5.318A	5.938A	6.540A																																																																
			%	7.90%	18.25%	28.76%	39.21%	49.43%	59.12%	69.63%	79.37%	88.63%	97.61%																																																																
		2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V																																																																
Output current	0.564A		1.310A	1.988A	2.704A	3.423A	4.118A	4.772A	5.417A	6.123A	6.645A																																																																		
%	8.42%		19.55%	29.67%	40.36%	51.09%	61.46%	71.22%	80.85%	91.39%	99.18%																																																																		
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%																																																																		
	Output current	0.592A	1.276A	1.980A	2.672A	3.359A	4.027A	4.676A	5.353A	5.978A	6.577A																																																																		
	%	8.84%	19.04%	29.55%	39.88%	50.13%	60.10%	69.79%	79.90%	89.22%	98.16%																																																																		

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**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°C	87 V~305V	P
			I/P : LOW-LINE-3V=87 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°C	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°C	PF= 0.969 / 230 VAC PF= 0.996 / 115 VAC PF= 0.935 / 277 VAC	P
4	EFFICIENCY	92.5% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	93.25 %	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°C	I = 1.141 A/ 230 VAC I = 2.311 A/ 115 VAC I = 0.997 A/ 277 VAC	P
6	INRUSH CURRENT	230V/ 75 A (TYP) COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 56.34 A/ 230 VAC	P
7	LEAKAGE CURRENT	< 0.75 mA / 277 VAC	I/P : 277 VAC O/P : Min LOAD Ta : 25°C	L-CASE : 0.3715 mA N-CASE : 0.3784 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 : 10.00 %/115VAC THD : 17.31 %/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 : 14.04 %/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°C	100.52 %/ 230 VAC 100.49 %/ 115 VAC Constant current limiting ,recovers automatically after fault condition is removed	P
2	OVER VOLTAGE PROTECTION	CH1 : 43 V ~ 52 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	47.4 V/ 230 VAC 47.4 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°C	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°C	(1) 470 V (2) 456 V (3) 454 V	P
2	Diode Peak Voltage	Q101 Rated : 150V/ 43A	I/P : High-Line +3V = 308 V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(1) 127 V (2) 45.2 V (3) 100 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°C	(1) 448 V (2) 440 V (3) 442 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°C	(1) 15.4 V (2) 15.4 V (3) 15.2 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°C	(1) 546 V (2) 512 V (3) 510 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°C	I/P-O/P : 3.087 mA I/P-FG : 3.412 mA O/P-FG : 1.863 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 : >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°C	PASS	P
2	CONDUCTION	EN55015	I/P: 230 VAC (50HZ)/115V[60HZ] O/P:FULL/65% LOAD Ta:25°C	PASS Test by certified Lab	P
3	RADIATION	EN55015	I/P: 230 VAC (50HZ)/115V[60HZ] O/P: FULL/65% LOAD Ta:25°C	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°C	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°C	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°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	TEMPERATURE RISE TEST	MODEL : HBG-240P-36 1. ROOM AMBIENT BURN-IN : 2.5 HRS I/P : 230VAC O/P : 95% LOAD Ta=34.7 °C 2. HIGH AMBIENT BURN-IN : 3.5 HRS I/P : 230VAC O/P : 95% LOAD Ta=53.7 °C	<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 34.7 °C</th> <th>HIGH AMBIENT Ta= 53.7 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF2</td><td>54.4°C</td><td>77.2°C</td></tr> <tr><td>2</td><td>BD1</td><td>77.2°C</td><td>98.3°C</td></tr> <tr><td>3</td><td>C5</td><td>55.5°C</td><td>82.2°C</td></tr> <tr><td>4</td><td>D2</td><td>58.7°C</td><td>87.0°C</td></tr> <tr><td>5</td><td>L1</td><td>54.4°C</td><td>85.9°C</td></tr> <tr><td>6</td><td>Q1</td><td>58.2°C</td><td>86.6°C</td></tr> <tr><td>7</td><td>C39</td><td>52.6°C</td><td>79.1°C</td></tr> <tr><td>8</td><td>U1</td><td>51.8°C</td><td>83.0°C</td></tr> <tr><td>9</td><td>Q3</td><td>59.1°C</td><td>88.4°C</td></tr> <tr><td>10</td><td>Q4</td><td>60.8°C</td><td>88.8°C</td></tr> <tr><td>11</td><td>T1</td><td>76.9°C</td><td>101.1°C</td></tr> <tr><td>12</td><td>Q101</td><td>84.2°C</td><td>112.0°C</td></tr> <tr><td>13</td><td>Q102</td><td>83.5°C</td><td>107.6°C</td></tr> <tr><td>14</td><td>C102</td><td>66.6°C</td><td>88.4°C</td></tr> <tr><td>15</td><td>C105</td><td>65.6°C</td><td>87.8°C</td></tr> <tr><td>16</td><td>LF100</td><td>60.7°C</td><td>83.8°C</td></tr> <tr><td>17</td><td>TSW1</td><td>63.2°C</td><td>83.1°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 34.7 °C	HIGH AMBIENT Ta= 53.7 °C	1	LF2	54.4°C	77.2°C	2	BD1	77.2°C	98.3°C	3	C5	55.5°C	82.2°C	4	D2	58.7°C	87.0°C	5	L1	54.4°C	85.9°C	6	Q1	58.2°C	86.6°C	7	C39	52.6°C	79.1°C	8	U1	51.8°C	83.0°C	9	Q3	59.1°C	88.4°C	10	Q4	60.8°C	88.8°C	11	T1	76.9°C	101.1°C	12	Q101	84.2°C	112.0°C	13	Q102	83.5°C	107.6°C	14	C102	66.6°C	88.4°C	15	C105	65.6°C	87.8°C	16	LF100	60.7°C	83.8°C	17	TSW1	63.2°C	83.1°C		P
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17	TSW1	63.2°C	83.1°C																																																																										
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 305VAC/100VAC O/P : 95 % LOAD Ta= -45°C	TEST : OK	P																																																																								
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45 °C NO DAMAGE	I/P : 305 VAC O/P : 95% LOAD Ta= 45 °C HUMIDITY= 95 %R.H	TEST : OK	P																																																																								
4	TEMPERATURE COEFFICIENT	±0.03 %(0~50°C)	I/P : 230 VAC O/P : 95% LOAD	±0.02 %(0~50°C)	P																																																																								
5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~+85°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																																																																								

6	THERMAL SHOCK TEST	1. Thermal shock Temperature : -45°C~ +50°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
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°C	TEST : OK	P
8	CAPACITOR LIFE CYCLE	HBG-240P-36:SUPPOSE C102 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=45 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta=45 °C LIFE TIME	(1) 415140 HRS (2) 85544 HRS (3) 69552 HRS	P
9	MTBF	Conducted by Parts Stress Analysis Prediction 2290.4K hrs min. Telcordia SR-332 (Bellcore) ; 175.1K hrs min. MIL-HDBK-217F (25°C)		P

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	ZHANGZJ/ZHOUB	SKY	LIUWY

2009/08/04 A50-G058