



# Test Report: HBG-100P-48

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100W Constant Current Mode 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	CURRENT RIPPLE	5% (max)	I/P : 230VAC O/P : LED MODE Ta : 25°C	TEST : <5%	P
2	CONSTANT CURRENT REGION	28.8 V ~ 48 V	I/P : 230VAC O/P : LED MODE Ta : 25°C	O/P= 28.8V : 2.057 A O/P= 48 V : 2.058 A	P
3	CURRENT ADJUST RANGE	1.2 A ~ 2 A	I/P : 230VAC I/P : 115VAC O/P : LED MODE Ta : 25°C	1.115 A ~ 2.142 A /230VAC 1.119 A ~ 2.145 A /115VAC	P
4	OUTPUT CURRENT TOLERANCE	±5%	I/P : 230VAC O/P : FULL/ MIN LOAD Ta : 25°C	TEST : <5%	P
5	SET UP TIME	230VAC : 500 ms (Max) 115VAC : 2000 ms(Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 350 ms 115VAC/ 512 ms	P
6	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	TEST : <5%	P
7	OPEN CIRCUIT VOLTAGE	49V (max)	I/P : 230 VAC O/P : NO LOAD Ta : 25°C	TEST : <49V	P

8	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" data-bbox="311 398 1369 510"> <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" data-bbox="311 544 1369 656"> <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" data-bbox="311 689 1369 824"> <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> <p>TEST RESULT: I/P : 230 VAC ;Ta : 25°C</p> <table border="1" data-bbox="311 884 1401 1440"> <tr> <td rowspan="3">1</td> <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>0.230A</td> <td>0.422A</td> <td>0.610A</td> <td>0.801A</td> <td>0.993A</td> <td>1.184A</td> <td>1.376A</td> <td>1.568A</td> <td>1.760A</td> <td>1.952A</td> </tr> <tr> <td>%</td> <td>11.50%</td> <td>21.10%</td> <td>30.50%</td> <td>40.05%</td> <td>49.65%</td> <td>59.20%</td> <td>68.80%</td> <td>78.40%</td> <td>88.00%</td> <td>97.60%</td> </tr> <tr> <td rowspan="3">2</td> <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>0.238A</td> <td>0.440A</td> <td>0.636A</td> <td>0.836A</td> <td>1.038A</td> <td>1.240A</td> <td>1.441A</td> <td>1.644A</td> <td>1.843A</td> <td>2.029A</td> </tr> <tr> <td>%</td> <td>11.90%</td> <td>22.00%</td> <td>31.80%</td> <td>41.80%</td> <td>51.90%</td> <td>62.00%</td> <td>72.05%</td> <td>82.20%</td> <td>92.15%</td> <td>100.5%</td> </tr> <tr> <td rowspan="3">3</td> <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>0.256A</td> <td>0.453A</td> <td>0.647A</td> <td>0.844A</td> <td>1.043A</td> <td>1.241A</td> <td>1.438A</td> <td>1.638A</td> <td>1.836A</td> <td>2.015A</td> </tr> <tr> <td>%</td> <td>12.80%</td> <td>22.65%</td> <td>32.35%</td> <td>42.20%</td> <td>52.15%</td> <td>62.05%</td> <td>71.90%</td> <td>81.90%</td> <td>91.80%</td> <td>100.8%</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%	1	Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	Output current	0.230A	0.422A	0.610A	0.801A	0.993A	1.184A	1.376A	1.568A	1.760A	1.952A	%	11.50%	21.10%	30.50%	40.05%	49.65%	59.20%	68.80%	78.40%	88.00%	97.60%	2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	Output current	0.238A	0.440A	0.636A	0.836A	1.038A	1.240A	1.441A	1.644A	1.843A	2.029A	%	11.90%	22.00%	31.80%	41.80%	51.90%	62.00%	72.05%	82.20%	92.15%	100.5%	3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Output current	0.256A	0.453A	0.647A	0.844A	1.043A	1.241A	1.438A	1.638A	1.836A	2.015A	%	12.80%	22.65%	32.35%	42.20%	52.15%	62.05%	71.90%	81.90%	91.80%	100.8%	P
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9	DALI DIMMING OPERATION (primary side for DA-Type)	<p>※DALI Interface            ·Apply DALI signal between DA+ and DA-.            ·DALI protocol comprises 16 groups and 64 addresses.            ·First step is fixed at 8% of output.</p> <p>I/P : 230 VAC            O/P : DIMMING TEST            Ta : 25°C            TEST RESULT : OK</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°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 : 90 VAC ~ 305 VAC O/P : FULL~MIN LOAD Ta : 25°C	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°C	PF= 0.986 / 230 VAC PF= 0.996 / 115 VAC PF= 0.976 / 277 VAC	P
4	EFFICIENCY	91% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	91.68 %	P
5	INPUT CURRENT	230V/ 0.5 A (TYP) 115V/ 1.1 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°C	I = 0.470 A/ 230 VAC I = 0.952 A/ 115 VAC I = 0.395 A/ 277 VAC	P
6	INRUSH CURRENT	230V/ 60 A (TYP) COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 58.47 A/ 230 VAC	P
7	LEAKAGE CURRENT	< 0.75 mA / 277 VAC	I/P : 277 VAC O/P : NO LOAD Ta : 25°C	L-CASE : 0.5614 mA N-CASE : 0.5702 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 : 9.50%/115VAC THD : 13.18%/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 : 12.67%/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	101.25 %/ 230 VAC 101.26 %/ 115 VAC Constant current limiting, recovers automatically after fault condition is removed.	P
2	OVER VOLTAGE PROTECTION	CH1 : 54 V ~ 63 V	I/P : 230 VAC I/P : 115 VAC O/P : NO LOAD Ta : 25°C	58.7 V/ 230 VAC 58.7 V/ 115 VAC Shut down 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, 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°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	Q1 Rated : 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°C	(1) 598 V (2) 484 V (3) 594 V	P
2	Diode Peak Voltage	Q101 Rated : 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°C	(1) 199 V (2) 155 V (3) 198 V	P
3	Input Capacitor Voltage	C5 Rated : 82u/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) 430 V (2) 422 V (3) 418 V	P
4	Control IC Voltage Test	U 1 Rated : 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°C	(1) 22.4 V (2) 22.4 V (3) 22.4 V	P
5	Power Transistor ( D to S) or (C to E) Peak Voltage	Q2 Rated : 600V/10A	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) 444 V (2) 428 V (3) 432 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 : 3.813 mA I/P-FG : 3.806 mA O/P-FG : 3.052 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-100P-48 1. ROOM AMBIENT BURN-IN : 2.5 HRS I/P : 230VAC O/P : 95% LOAD Ta=31.3 °C 2. HIGH AMBIENT BURN-IN : 3.5 HRS I/P : 230VAC O/P : 95% LOAD Ta=43.8 °C	<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 31.3 °C</th> <th>HIGH AMBIENT Ta= 43.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>BD1</td><td>69.3°C</td><td>80.8°C</td></tr> <tr><td>2</td><td>C5</td><td>66.7°C</td><td>78.0°C</td></tr> <tr><td>3</td><td>C11</td><td>61.5°C</td><td>73.4°C</td></tr> <tr><td>4</td><td>D6</td><td>69.8°C</td><td>83.1°C</td></tr> <tr><td>5</td><td>D12</td><td>83.6°C</td><td>96.2°C</td></tr> <tr><td>6</td><td>Q2</td><td>78.6°C</td><td>90.6°C</td></tr> <tr><td>7</td><td>Q1</td><td>81.0°C</td><td>95.9°C</td></tr> <tr><td>8</td><td>U1</td><td>61.8°C</td><td>72.8°C</td></tr> <tr><td>9</td><td>C18</td><td>69.0°C</td><td>80.7°C</td></tr> <tr><td>10</td><td>T1</td><td>95.7°C</td><td>107.8°C</td></tr> <tr><td>11</td><td>Q101</td><td>70.2°C</td><td>91.5°C</td></tr> <tr><td>12</td><td>C106</td><td>65.9°C</td><td>77.2°C</td></tr> <tr><td>13</td><td>C107</td><td>69.7°C</td><td>80.1°C</td></tr> <tr><td>14</td><td>RTH2</td><td>52.1°C</td><td>66.5°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 31.3 °C	HIGH AMBIENT Ta= 43.8 °C	1	BD1	69.3°C	80.8°C	2	C5	66.7°C	78.0°C	3	C11	61.5°C	73.4°C	4	D6	69.8°C	83.1°C	5	D12	83.6°C	96.2°C	6	Q2	78.6°C	90.6°C	7	Q1	81.0°C	95.9°C	8	U1	61.8°C	72.8°C	9	C18	69.0°C	80.7°C	10	T1	95.7°C	107.8°C	11	Q101	70.2°C	91.5°C	12	C106	65.9°C	77.2°C	13	C107	69.7°C	80.1°C	14	RTH2	52.1°C	66.5°C		P
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13	C107	69.7°C	80.1°C																																																														
14	RTH2	52.1°C	66.5°C																																																														
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 305VAC/100VAC O/P : 95 % LOAD Ta= -45/-30°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 %(0~45°C)	I/P : 230 VAC O/P : 95% LOAD	±0.008 %(0~45°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-100P-48:SUPPOSE C107 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) 265160 HRS (2) 76671 HRS (3) 154484 HRS	P
9	MTBF	Conducted by Parts Stress Analysis Prediction 2612.1K hrs min. Telcordia SR-332 (Bellcore) ; 346.9K hrs min. MIL-HDBK-217F (25°C)		P
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50,000 hours @ Ta 45°C		P

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	ZHANGZJ/ZHKB	SKY	LIUWY

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