



# Test Report: HBG-100P-36

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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	21.6 V ~ 36 V	I/P : 230VAC O/P : LED MODE Ta : 25°C	O/P= 21.6V : 2.726 A O/P= 36 V : 2.728 A	P
3	CURRENT ADJUST RANGE	1.62 A ~ 2.7 A	I/P : 230VAC I/P : 115VAC O/P : LED MODE Ta : 25°C	1.335 A ~ 3.098 A /230VAC 1.336 A ~ 3.100 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/ 491 ms 115VAC/ 510 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	37V (max)	I/P : 230 VAC O/P : NO LOAD Ta : 25°C	TEST : <37V	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="311 392 1364 504"> <tr> <th>Resistance value</th> <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> <th>Output current</th> <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="311 537 1364 649"> <tr> <th>Dimming value</th> <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> <th>Output current</th> <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="311 683 1364 817"> <tr> <th>Duty value</th> <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> <th>Output current</th> <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 1396 1433"> <tr> <td rowspan="3">1</td> <th>Resistance value</th> <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> <th>Output current</th> <td>0.281A</td><td>0.542A</td><td>0.801A</td><td>1.062A</td><td>1.322A</td><td>1.582A</td><td>1.842A</td><td>2.100A</td><td>2.359A</td><td>2.618A</td> </tr> <tr> <th>%</th> <td>10.41%</td><td>20.07%</td><td>29.67%</td><td>39.33%</td><td>48.96%</td><td>58.59%</td><td>68.22%</td><td>77.78%</td><td>87.37%</td><td>96.96%</td> </tr> <tr> <td rowspan="3">2</td> <th>Dimming value</th> <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> <th>Output current</th> <td>0.294A</td><td>0.570A</td><td>0.842A</td><td>1.118A</td><td>1.395A</td><td>1.669A</td><td>1.943A</td><td>2.223A</td><td>2.497A</td><td>2.727A</td> </tr> <tr> <th>%</th> <td>10.89%</td><td>21.11%</td><td>31.19%</td><td>41.41%</td><td>51.67%</td><td>61.81%</td><td>71.96%</td><td>82.33%</td><td>92.48%</td><td>101.0%</td> </tr> <tr> <td rowspan="3">3</td> <th>Duty value</th> <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> <th>Output current</th> <td>0.316A</td><td>0.584A</td><td>0.853A</td><td>1.121A</td><td>1.392A</td><td>1.660A</td><td>1.928A</td><td>2.198A</td><td>2.465A</td><td>2.707A</td> </tr> <tr> <th>%</th> <td>11.70%</td><td>21.63%</td><td>31.59%</td><td>41.52%</td><td>51.56%</td><td>61.48%</td><td>71.41%</td><td>81.41%</td><td>91.30%</td><td>100.3%</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	0.281A	0.542A	0.801A	1.062A	1.322A	1.582A	1.842A	2.100A	2.359A	2.618A	%	10.41%	20.07%	29.67%	39.33%	48.96%	58.59%	68.22%	77.78%	87.37%	96.96%	2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	Output current	0.294A	0.570A	0.842A	1.118A	1.395A	1.669A	1.943A	2.223A	2.497A	2.727A	%	10.89%	21.11%	31.19%	41.41%	51.67%	61.81%	71.96%	82.33%	92.48%	101.0%	3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Output current	0.316A	0.584A	0.853A	1.121A	1.392A	1.660A	1.928A	2.198A	2.465A	2.707A	%	11.70%	21.63%	31.59%	41.52%	51.56%	61.48%	71.41%	81.41%	91.30%	100.3%	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  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 )	87 V~305V  TEST : OK	P
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= 0.975 / 277 VAC	P
4	EFFICIENCY	91% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	91.32 %	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 = 0.474 A/ 230 VAC I = 0.958 A/ 115 VAC I = 0.397 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 = 55.63 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 : 0.5995 mA N-CASE : 0.5957 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 : 9.85%/115VAC THD : 13.70%/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 : 13.14%/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	101.03 %/ 230 VAC 101.07 %/ 115 VAC Constant current limiting, recovers automatically after fault condition is removed.	P
2	OVER VOLTAGE PROTECTION	CH1 : 41 V ~ 49 V	I/P : 230 VAC I/P : 115 VAC O/P : NO LOAD Ta : 25°C	46.0 V/ 230 VAC 46.0 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) 588 V (2) 474 V (3) 584 V	P
2	Diode Peak Voltage	Q101 Rated : 170V/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) 151 V (2) 116 V (3) 149 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) 442 V (2) 410 V (3) 430 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) 22.3 V (2) 22.3 V (3) 22.3 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) 486 V (2) 428 V (3) 440 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 : 3.882 mA I/P-FG : 3.821 mA O/P-FG : 3.076 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-36 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>69.5°C</td><td>76.3°C</td></tr> <tr><td>2</td><td>C5</td><td>67.4°C</td><td>73.6°C</td></tr> <tr><td>3</td><td>C11</td><td>64.1°C</td><td>70.7°C</td></tr> <tr><td>4</td><td>D6</td><td>74.3°C</td><td>81.3°C</td></tr> <tr><td>5</td><td>D12</td><td>81.9°C</td><td>88.2°C</td></tr> <tr><td>6</td><td>Q2</td><td>78.6°C</td><td>84.8°C</td></tr> <tr><td>7</td><td>Q1</td><td>82.5°C</td><td>88.9°C</td></tr> <tr><td>8</td><td>U1</td><td>58.8°C</td><td>67.0°C</td></tr> <tr><td>9</td><td>C18</td><td>65.9°C</td><td>74.1°C</td></tr> <tr><td>10</td><td>T1</td><td>59.6°C</td><td>90.9°C</td></tr> <tr><td>11</td><td>Q101</td><td>82.0°C</td><td>90.1°C</td></tr> <tr><td>12</td><td>C106</td><td>65.4°C</td><td>75.6°C</td></tr> <tr><td>13</td><td>C107</td><td>67.5°C</td><td>76.0°C</td></tr> <tr><td>14</td><td>RTH2</td><td>53.7°C</td><td>60.9°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 31.3 °C	HIGH AMBIENT Ta= 43.8 °C	1	BD1	69.5°C	76.3°C	2	C5	67.4°C	73.6°C	3	C11	64.1°C	70.7°C	4	D6	74.3°C	81.3°C	5	D12	81.9°C	88.2°C	6	Q2	78.6°C	84.8°C	7	Q1	82.5°C	88.9°C	8	U1	58.8°C	67.0°C	9	C18	65.9°C	74.1°C	10	T1	59.6°C	90.9°C	11	Q101	82.0°C	90.1°C	12	C106	65.4°C	75.6°C	13	C107	67.5°C	76.0°C	14	RTH2	53.7°C	60.9°C		P
NO	Position	ROOM AMBIENT Ta= 31.3 °C	HIGH AMBIENT Ta= 43.8 °C																																																														
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12	C106	65.4°C	75.6°C																																																														
13	C107	67.5°C	76.0°C																																																														
14	RTH2	53.7°C	60.9°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	±0.018 %(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-36: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) 308552 HRS (2) 101813 HRS (3) 149290 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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