



Test Report: HBG-200-60

200W 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

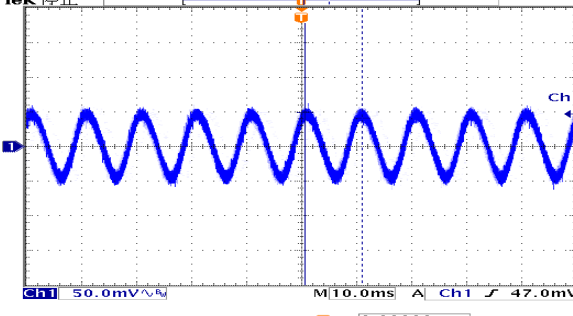
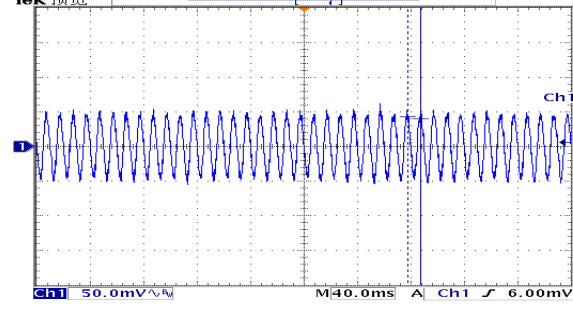
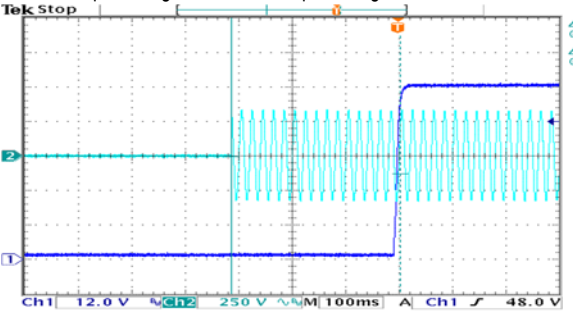
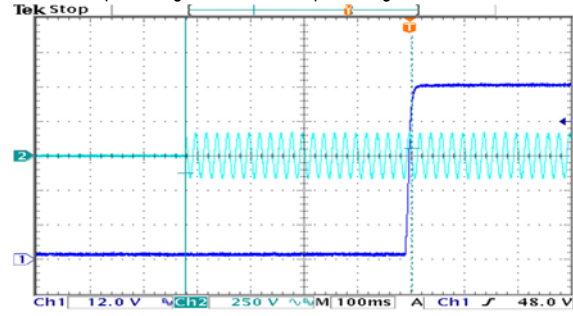
E.M.C. Test

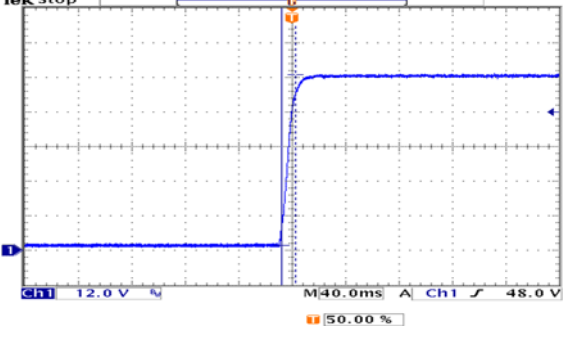
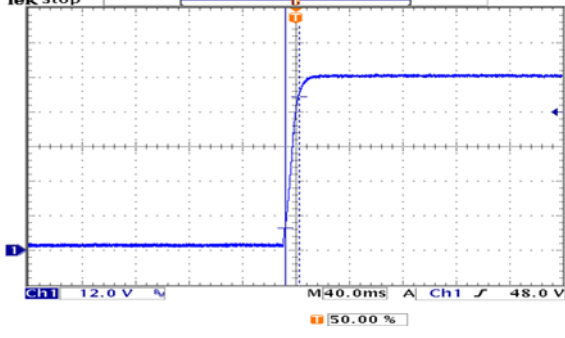
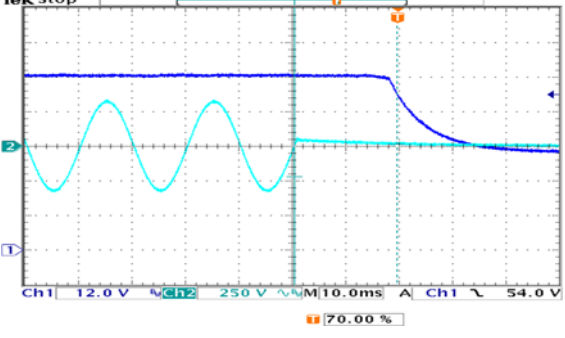
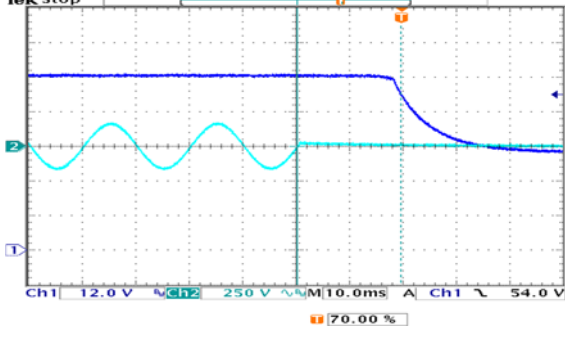
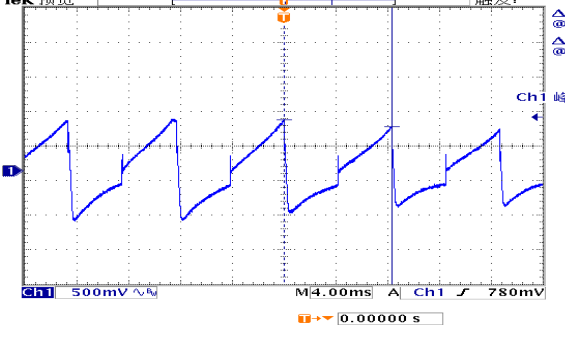
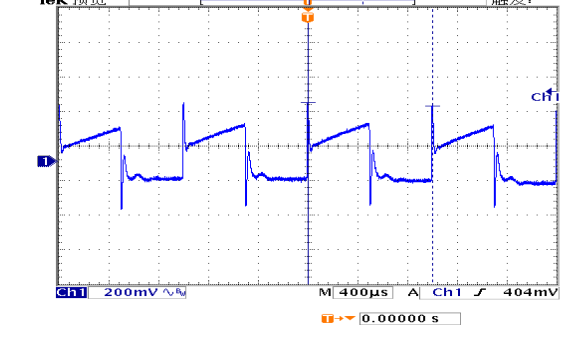
■ RELIABILITY TEST

Environment Test

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

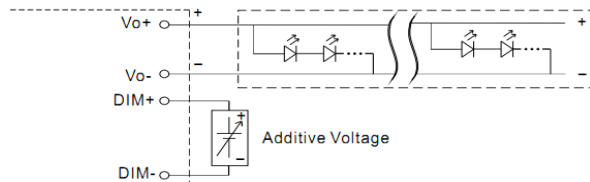
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONSTANT CURRENT REGION	36 V~ 60 V	I/P: 230VAC O/P: LED MODE Ta: 25°C	21V~ 60V
2	OUTPUT CURRENT ADJUST RANGE (For A-Type And AB-Type)	1.98A~3.3A	I/P: 230VAC O/P: SETING Ta: 25°C	1.05A~3.6A
3	OUTPUT VOLTAGE TOLERANCE	-2%~+2%	I/P: 90VAC / 305VAC O/P: FULL/60%/ NO LOAD Ta: 25°C	-0%~ 0%
4	LINE REGULATION	-0.5%~+0.5%	I/P: 90VAC ~ 305VAC O/P: 60% ~ FULL LOAD Ta: 25°C	-0%~ 0%
5	LOAD REGULATION	-1.0%~+1.0%	I/P: 230VAC O/P: FULL/ NO LOAD Ta: 25°C	-0%~ 0%
6	OVER/UNDERSHOOT TEST	<± 5 %	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	<5 %
7	RIPPLE & NOISE (Max)	350mVp-p	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	120 mVp-p
<div style="display: flex; justify-content: space-around;"> <div style="width: 45%;"> <p>high frequency :</p>  </div> <div style="width: 45%;"> <p>low frequency :</p>  </div> </div>				
8	SET UP TIME(Max)	230VAC/ 500ms 115VAC/ 2500ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL/80% LOAD Ta: 25°C	230VAC/ 246 ms 115VAC/ 600 ms
<div style="display: flex; justify-content: space-around;"> <div style="width: 45%;"> <p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1: Output Voltage CH2: AC Input Voltage</p>  </div> <div style="width: 45%;"> <p>INPUT=115VAC/60HZ @ 80% LOAD</p> <p>CH1: Output Voltage CH2: AC Input Voltage</p>  </div> </div>				

9	RISE TIME (Max)	230VAC/ 100ms 115VAC/ 100ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL/80% LOAD Ta: 25°C	230VAC/10.4 ms 115VAC/10.4 ms
<div> <div> INPUT=230VAC/50HZ @ FULL LOAD CH1: Output Voltage  </div> <div> INPUT=115VAC/60HZ @ 80% LOAD CH1: Output Voltage  </div> </div>				
10	HOLD UP TIME(Typ)	230VAC/ 10ms 115VAC/ 10ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL/80% LOAD Ta: 25°C	230VAC/19.2 ms 115VAC/19.4 ms
<div> <div> INPUT=230VAC/50HZ @ FULL LOAD CH1: Output Voltage CH2: AC Input Voltage  </div> <div> INPUT=115VAC/60HZ @ 80% LOAD CH1: Output Voltage CH2: AC Input Voltage  </div> </div>				
11	DYNAMIC LOAD	V1: 6000 mVp-p	I/P: 230VAC O/P: (1) FULL/50% LOAD 50%DUTY / 120HZ (2) FULL /50% LOAD 50%DUTY / 1KHZ Ta: 25°C	(1) 1480mVp-p (2) 620mVp-p
<div> <div> FULL /50% LOAD 50%DUTY / 120HZ  </div> <div> FULL /50% LOAD 50%DUTY / 1KHZ  </div> </div>				

12 DIMMING OPERATION (for B-Type)

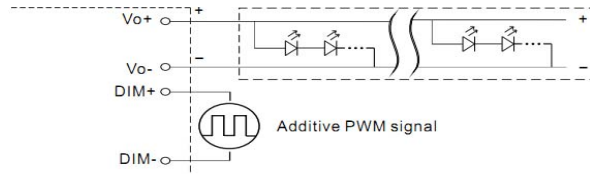
- Output constant current level can be adjusted by applying one of the three methodologies between DIM+ and DIM-: 0 ~ 10Vdc, or 10V PWM signal or resistance.
- Direct connecting to LEDs is suggested. It is not suitable to be used with additional drivers.
- Dimming source current from power supply: 100uA(typ.)

Ⓒ Applying additive 0 ~ 10VDC



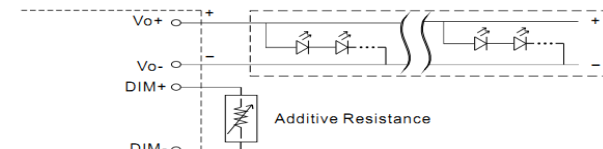
"DO NOT connect "DIM- to Vo-"

Ⓒ Applying additive 10V PWM signal (frequency range 100Hz ~ 3KHz):



"DO NOT connect "DIM- to Vo-"

Ⓒ Applying additive resistance:



"DO NOT connect "DIM- to Vo-"

Note : 1. Min. dimming level is about 8% and the output current is not defined when 0% < Iout < 8%.

2. The output current could drop down to 0% when dimming input is about 0kΩ or 0Vdc, or 10V PWM signal with 0% duty cycle.

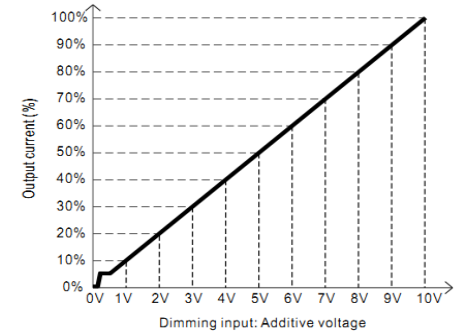
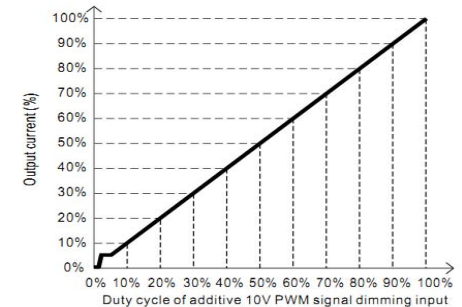
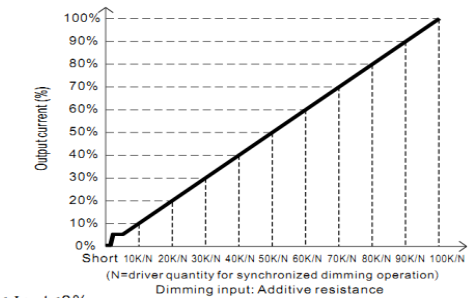
I/P: 230 VAC

O/P: DIMMING TEST

Ta: 25°C

	DIMMING	Short	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
1	Output Current	0	0.2688A	0.6052A	0.9256A	1.2592A	1.5892A	1.9340A	2.2696A	2.5944A	2.9264A	3.3249A	3.3360A
	%	0%	8.15%	18.34%	28.05%	38.16%	48.16%	58.61%	68.78%	78.62%	88.68%	100.75%	101.09%
	PWM(100Hz)	0V	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
2	Output Current	0	0.2708A	0.6044A	0.9372A	1.2636A	1.5976A	1.9336A	2.2652A	2.5952A	2.9260A	3.2496A	3.3608A
	%	0%	8.21%	18.32%	28.40%	38.29%	48.41%	58.59%	68.64%	78.64%	88.67%	98.47%	101.84%
	R	0%	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN
3	Output Current	0	0.2712A	0.6128A	0.9532A	1.2936A	1.6400A	1.9876A	2.3360A	2.6832A	3.0312A	3.3156A	3.3540A
	%	0%	8.22%	18.57%	28.88%	39.20%	49.70%	60.23%	70.79%	81.31%	91.85%	100.47%	101.64%

TEST RESULT: OK



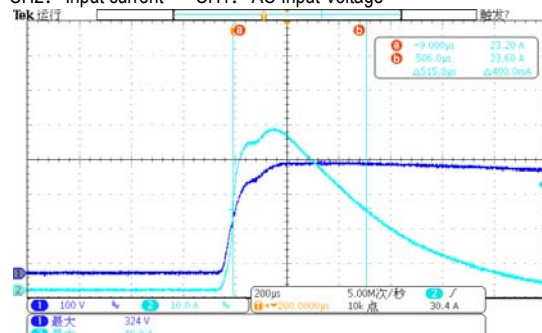
13	DALI DIMMING OPERATION (primary side; for DA-Type)	※DALI Interface ·Apply DALI signal between DA+ and DA-. ·DALI protocol comprises 16 groups and 64 addresses. ·First step is fixed at 8% of output. I/P: 230 VAC O/P: DIMMING TEST Ta: 25°C TEST RESULT: OK
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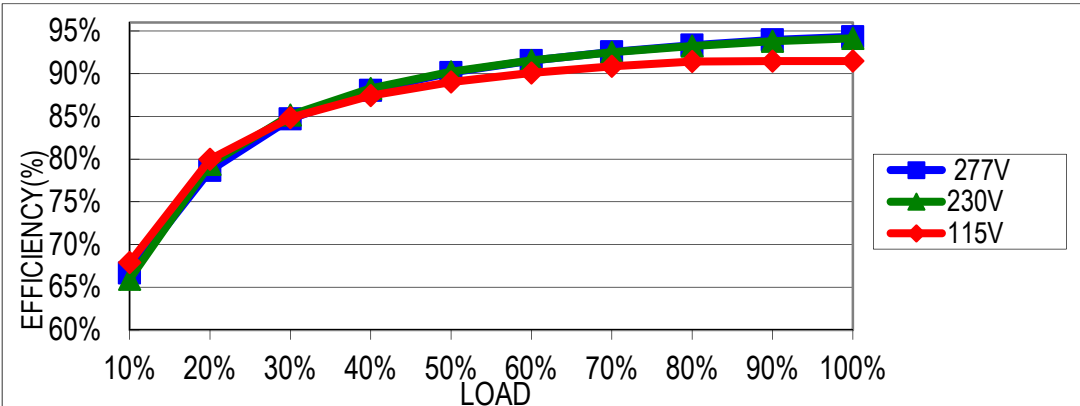
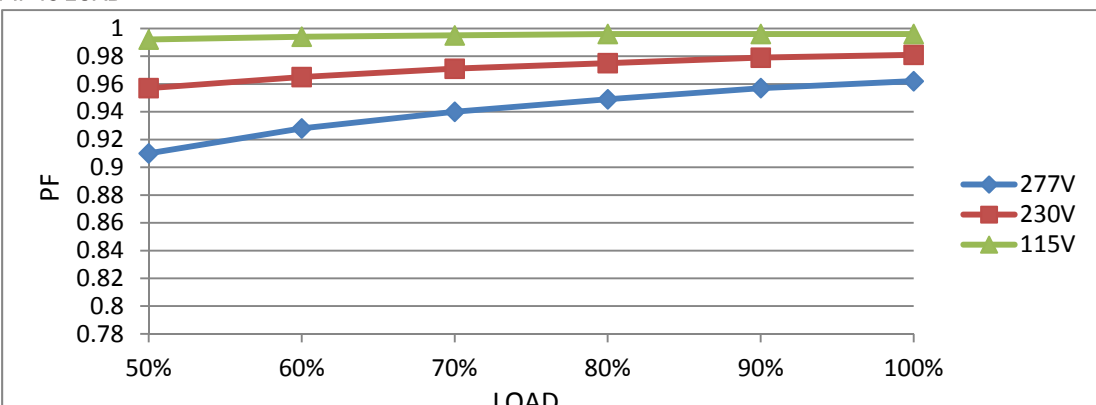
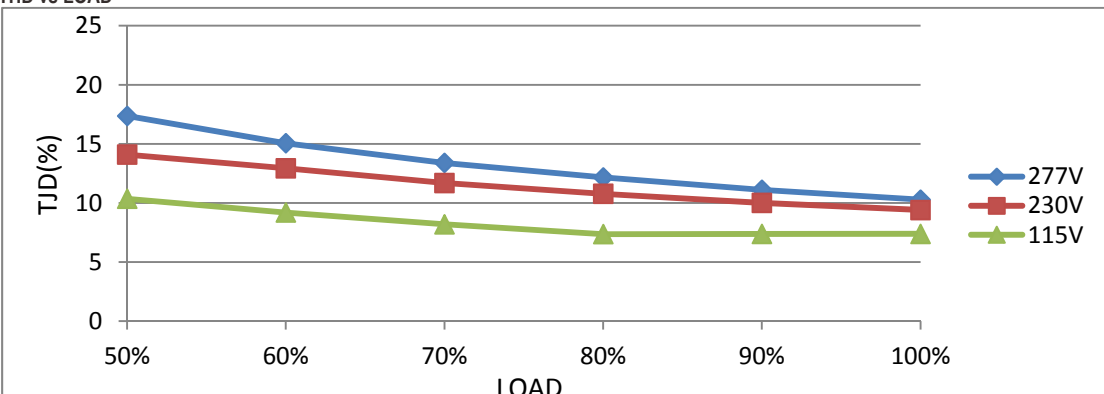
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~305VAC	I/P: TESTING O/P: 60% ~FULL LOAD Ta: 25°C (1)I/P: LOW-LINE-3V=87 V HIGH-LINE+10V=315 V O/P: 60% ~FULL LOAD ON: 30 Sec OFF: 30 Sec 10MIN (2)230VAC ON: 0.5 Sec OFF: 0.5 Sec 20MIN (POWER ON/OFF NO DAMAGE)	87 V~ 305 V TEST: OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P: 90 VAC ~305 VAC O/P: FULL ~NO LOAD Ta: 25°C	TEST: OK
3	AC CURRENT	1.9A/115VAC 1.0A/230VAC 0.9A/277VAC	I/P: 115 VAC I/P: 230 VAC I/P: 277 VAC O/P: FULL /80% LOAD Ta: 25°C	I = 1.00 A/ 115VAC I = 0.98 A/ 230VAC I = 0.96 A/ 277VAC
4	LEAKAGE CURRENT	< 0.75mA / 277VAC	I/P: 277 VAC O/P: NO LOAD Ta: 25°C	L-FG: 0.353 mA N-FG: 0.347 mA
6	INRUSH CURRENT(Typ)	230V/ 85A Twidth =600us measured at 50% Ipeak COLD START	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	I = 46.8A/ 230VAC Twidth =515 us

INPUT=230VAC/50HZ @ FULL LOAD

CH2: Input current CH1: AC Input Voltage



7	EFFICIENCY(Typ)	93.5	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	94.14
	EFFICIENCY vs LOAD 			
8	POWER FACTOR	0.98/ 115VAC 0.95/ 230VAC 0.92/ 277VAC	I/P: 115 VAC I/P: 230 VAC I/P: 277 VAC O/P: FULL LOAD/80% LOAD Ta: 25°C	PF= 0.996 / 115VAC PF= 0.981 / 230VAC PF= 0.962 / 277VAC
	P.F vs LOAD 			
9	TOTAL HARMONIC DISTORTION	THD<20% (@load≥60%/115VAC, 230VAC; @load≥75%/277VAC)	I/P: 115 VAC/60% LOAD I/P: 230 VAC/60% LOAD I/P: 277 VAC/75% LOAD Ta: 25°C	THD=9.19% @60% load /115VAC THD=12.93 @60% load /230VAC THD=12.73@75% load /277VAC
	THD vs LOAD 			

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER CURRENT PROTECTION	95%~108%	I/P: 90VAC I/P: 230VAC I/P: 305VAC O/P: TESTING Ta: 25°C	101.51%/ 90VAC 101.51%/ 230VAC 101.51%/ 305VAC Constant Current Limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	65V ~ 75V	I/P: 90VAC I/P: 230VAC I/P: 305VAC O/P: NO LOAD Ta: 25°C	70.33V/ 90VAC 70.30V/ 230VAC 70.33V/ 305VAC Shut down o/p voltage with auto-recovery or re-power on to recovery
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE Shut down o/p voltage, recovers automatically after temperature goes down
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 305VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE Hiccup mode or constant current limiting, recovers automatically after fault condition is removed

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q6 Rated 13.8A/600V	I/P: High-Line +3V =308V O/P: (1) FULL LOAD Turn on (2) Output Short (3) FULL LOAD continue Ta: 25°C	(1) 518V (2) 442V (3) 516V
2	O/P Diode (MOSFET)	D100 Rated 30A/100V	I/P: High-Line +3V =308V O/P: (1) FULL LOAD Turn on (2) Output Short (3) FULL LOAD continue Ta: 25°C	(1)132V (2) 16.4V (3)131V
3	Input Capacitor	C5 Rated 100u/ 450V	I/P: High-Line +3V =308 V O/P: (1) FULL LOAD input on/off (2) NO LOAD input on /Off (3) FULL LOAD /NO LOAD Change Ta: 25°C	(1) 448V (2) 447 V (3) 446 V
4	Control IC	U2 Rated 16V (MAX.)	I/P: High-Line +3V =308 V O/P: ((1) FULL LOAD (2) Output Short (3) O.L.P (4) O.V.P (5) Low Line No Load Vo(min) Ta: 25°C	(1) 13.8V (2) 14.3V (3) 14.2 V (4) 13.7V (5) 13.6 V
5	PFC Power Transistor	Q 1 Rated 16.8A/650V	I/P: High-Line +3V =308V O/P: (1) FULL LOAD Turn on (2) Output Short (3) FULL LOAD continue Ta: 25°C	(1) 588V (2) 504V (3) 586V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3.75KVAC/min I/P-FG: 2.0KVAC/min O/P-FG: 0.5KVAC/min	I/P-O/P: 4.2KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG: 0.6 KVAC/min Ta: 25°C	I/P-O/P: 2.405mA I/P-FG: 2.070 mA O/P-FG: 3.754 mA NO DAMAGE
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	I/P-O/P: >9999 MΩ I/P-FG: >9999 MΩ O/P-FG: >9999 MΩ
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 50 mΩ EN 60950-1	40 A / 2 min Ta:25°C / 70%RH	14 mΩ

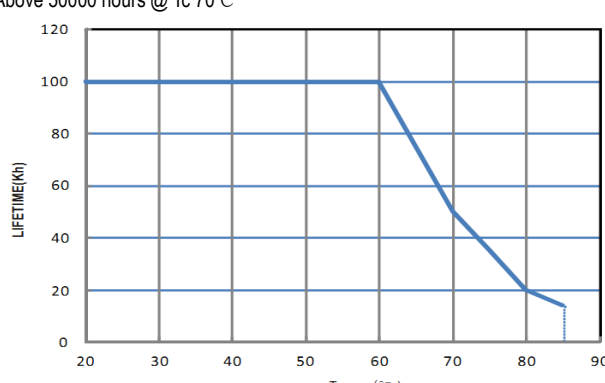
E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 Class C	I/P: 230VAC/50HZ O/P: FULL/60% LOAD Ta: 25°C	PASS
2	CONDUCTION	EN55015	I/P: 230 VAC (50HZ) O/P: FULL LOAD Ta: 25°C	PASS Test by certified Lab
3	RADIATION	EN55015	I/P: 230 VAC (50HZ) O/P: FULL LOAD Ta: 25°C	PASS Test by certified Lab
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	PASS
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	I/P: 230VAC/50HZ O/P: FULL LOAD Ta: 25°C	PASS
6	SURGE	EN61000-4-5 INDUSTRY L-N: 2KV L,N-PE: 4KV	I/P: 230VAC/50HZ O/P: FULL LOAD Ta: 25°C	PASS
7	Test by certified Lab & Test Report Prepare			

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																				
1	TEMPERATURE RISE TEST	<div>MODEL: HBG-200-60</div> <div>1. ROOM AMBIENT BURN-IN: 2 HRS</div> <div>I/P: 230VAC O/P: FULL LOAD Ta=33.4℃</div> <div>2. HIGH AMBIENT BURN-IN: 2 HRS</div> <div>I/P: 230VAC O/P: FULL LOAD Ta=60.2℃</div> <table><thead><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta=33.4℃</th><th>HIGH AMBIENT Ta=60.2℃</th></tr></thead><tbody><tr><td>1</td><td>C2</td><td>59.5℃</td><td>79.5℃</td></tr><tr><td>2</td><td>LF2</td><td>61.0℃</td><td>85.5℃</td></tr><tr><td>3</td><td>BD1</td><td>64.7℃</td><td>86.8℃</td></tr><tr><td>4</td><td>C8</td><td>68.1℃</td><td>90.5℃</td></tr><tr><td>5</td><td>RTH1</td><td>78.0℃</td><td>90.7℃</td></tr><tr><td>6</td><td>L1</td><td>58.8℃</td><td>97.5℃</td></tr><tr><td>7</td><td>L2</td><td>63.6℃</td><td>85.0℃</td></tr><tr><td>8</td><td>Q1</td><td>64.9℃</td><td>91.1℃</td></tr><tr><td>9</td><td>D5</td><td>65.1℃</td><td>92.2℃</td></tr><tr><td>10</td><td>C5</td><td>62.2℃</td><td>88.7℃</td></tr><tr><td>11</td><td>Q6</td><td>65.1℃</td><td>92.9℃</td></tr><tr><td>12</td><td>U1</td><td>62.2℃</td><td>90.0℃</td></tr><tr><td>13</td><td>U2</td><td>58.0℃</td><td>89.7℃</td></tr><tr><td>14</td><td>T1</td><td>69.1℃</td><td>85.1℃</td></tr><tr><td>15</td><td>D100</td><td>69.4℃</td><td>95.3℃</td></tr><tr><td>16</td><td>C102</td><td>61.1℃</td><td>95.3℃</td></tr><tr><td>17</td><td>LF100</td><td>54.2℃</td><td>81.4℃</td></tr><tr><td>18</td><td>C205</td><td>60.4℃</td><td>80.4℃</td></tr><tr><td>19</td><td>RTH2</td><td>58.0℃</td><td>86.7℃</td></tr><tr><td>20</td><td>TC</td><td>51.1℃</td><td>76.6℃</td></tr></tbody></table>			NO	Position	ROOM AMBIENT Ta=33.4℃	HIGH AMBIENT Ta=60.2℃	1	C2	59.5℃	79.5℃	2	LF2	61.0℃	85.5℃	3	BD1	64.7℃	86.8℃	4	C8	68.1℃	90.5℃	5	RTH1	78.0℃	90.7℃	6	L1	58.8℃	97.5℃	7	L2	63.6℃	85.0℃	8	Q1	64.9℃	91.1℃	9	D5	65.1℃	92.2℃	10	C5	62.2℃	88.7℃	11	Q6	65.1℃	92.9℃	12	U1	62.2℃	90.0℃	13	U2	58.0℃	89.7℃	14	T1	69.1℃	85.1℃	15	D100	69.4℃	95.3℃	16	C102	61.1℃	95.3℃	17	LF100	54.2℃	81.4℃	18	C205	60.4℃	80.4℃	19	RTH2	58.0℃	86.7℃	20	TC	51.1℃	76.6℃
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14	T1	69.1℃	85.1℃																																																																																					
15	D100	69.4℃	95.3℃																																																																																					
16	C102	61.1℃	95.3℃																																																																																					
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18	C205	60.4℃	80.4℃																																																																																					
19	RTH2	58.0℃	86.7℃																																																																																					
20	TC	51.1℃	76.6℃																																																																																					
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P: 305VAC/90VAC O/P: FULL/60% LOAD Ta= -45℃/-35℃	TEST: OK																																																																																				
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50℃ NO DAMAGE	I/P: 305VAC O/P: FULL LOAD Ta=50℃ HUMIDITY= 95 %R.H	TEST: OK																																																																																				
4	TEMPERATURE COEFFICIENT	±0.03 %/℃ (0~50℃)	I/P: 230 VAC O/P: FULL LOAD	±0.0012%/℃ (0~50℃)																																																																																				
5	STORAGE TEMPERATURE TEST	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		TEST: OK																																																																																				

6	THERMAL SHOCK TEST	1. Thermal shock Temperature: $-45^{\circ}\text{C} \sim +55^{\circ}\text{C}$ 2. Temperature change rate : $25^{\circ}\text{C} / \text{MIN}$ 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 AC on 3 sec/AC off 1 sec TEST	TEST: OK
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°C	TEST: OK
8	CAPACITOR LIFE CYCLE	HBG-200-60: 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= 60°C LIFE TIME (3) I/P: 230VAC O/P: 75% LOAD Ta= 60°C LIFE TIME (4) I/P: 230VAC O/P: 50% LOAD Ta= 60°C LIFE TIME	(1) 508156 HRS (2) 47796 HRS (3) 48139 HRS (4) 66646 HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 252.3 K hrs min MIL-HDBK-217F (25°C)	
10	DMTBF/Accelerated Life Test	<p>Demonstration Mean Time Between Failure(Expected Life) :</p> <p>Above 50000 hours @ Tc 70°C</p>  <p>The graph plots Lifetime (kh) on the y-axis (0 to 120) against Tcase ($^{\circ}\text{C}$) on the x-axis (20 to 90). A horizontal line at 100 kh extends to 60°C. From 60°C, the lifetime decreases as temperature increases, passing through approximately 50 kh at 70°C and 20 kh at 80°C, ending near 10 kh at 90°C.</p>	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	SHENJW/ZHUOKB	SKY	LIUWY