



# Test Report: HBG-100-48

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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

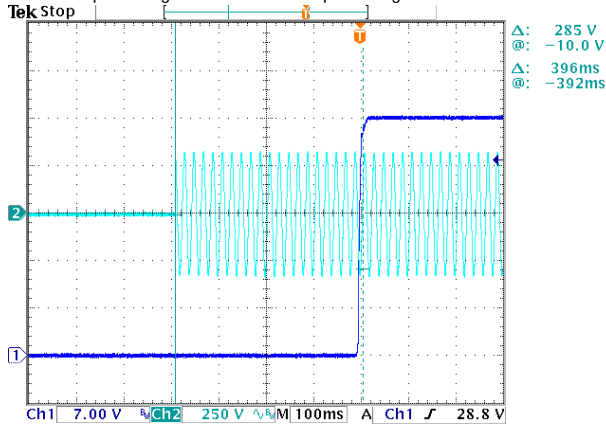
## DESIGN VERIFY TEST

### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONSTANT CURRENT REGION	28.8V-48V	I/P: 230VAC O/P: LED MODE Ta: 25°C	28.8V-48V
2	OUTPUT CURRENT ADJUST RANGE (For A-Type only)	1.2A-2.0A	I/P: 230VAC O/P: SETTING Ta: 25°C	1.1 A- 2.1 A
3	CURRENT RIPPLE	5.0% max.@rated current	I/P: 230VAC O/P: FULL/MIN LOAD Ta: 25°C	2.31%
4	CURRENT TOLERANCE	<±5.0%	I/P: 230VAC O/P: FULL/MIN LOAD Ta: 25°C	<5%
5	OPEN CIRCUIT VOLTAGE (max)	49V	I/P: 230VAC O/P: NO LOAD Ta: 25°C	48.6V
6	SET UP TIME	500ms/230VAC 2000ms/115VAC	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	396ms/230VAC 254ms/115VAC

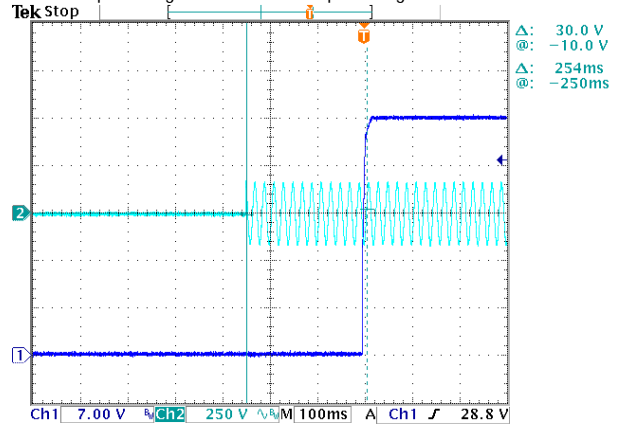
INPUT=230VAC/50HZ @ FULL LOAD

CH1: Output Voltage CH2: AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

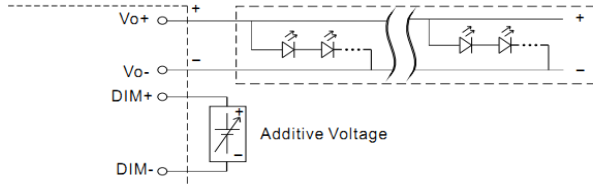
CH1: Output Voltage CH2: AC Input Voltage



7 DIMMING OPERATION (for B-Type)

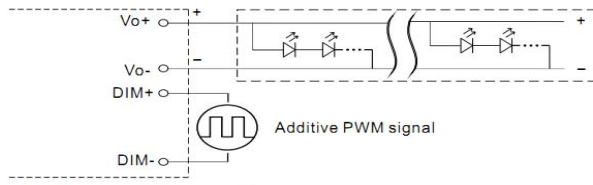
- Output constant current level can be adjusted by applying one of the three methodologies between DIM+ and DIM-: 0 ~ 10Vdc, or 10V PWM signal or resistance.
- Direct connecting to LEDs is suggested. It is not suitable to be used with additional drivers.
- Dimming source current from power supply: 100uA(typ.)

◎ Applying additive 0 ~ 10VDC



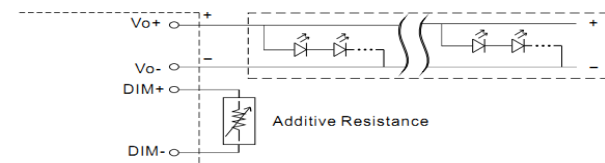
"DO NOT connect "DIM- to Vo-"

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

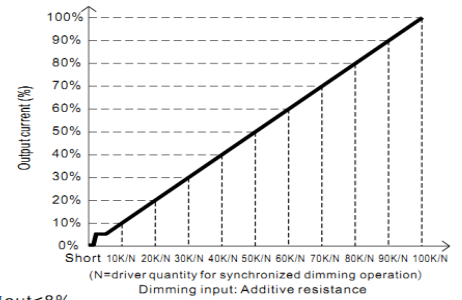
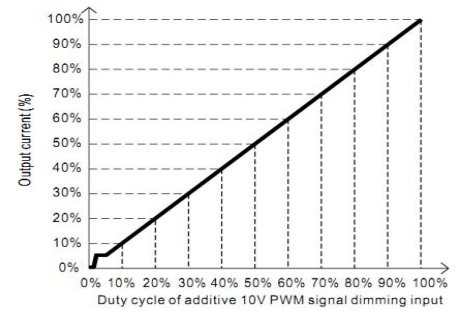
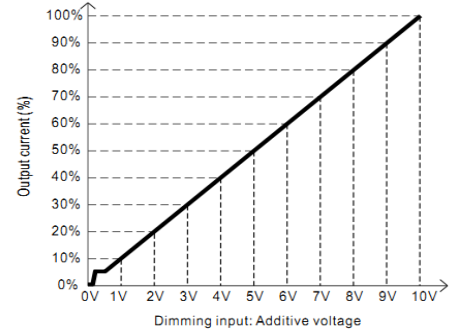


"DO NOT connect "DIM- to Vo-"

◎ 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

	V	Short	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
1	Output Current	0	0.294A	0.570A	0.842A	1.118A	1.395A	1.669A	1.943A	2.223A	2.497A	2.727A
	%	0%	10.89%	21.11%	31.19%	41.41%	51.67%	61.81%	71.96%	82.33%	92.48%	101.0%
2	PWM(100Hz)	0V	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Output Current	0	0.316A	0.584A	0.853A	1.121A	1.392A	1.660A	1.928A	2.198A	2.465A	2.707A
	%	0%	11.70%	21.63%	31.59%	41.52%	51.56%	61.48%	71.41%	81.41%	91.30%	100.3%
3	R	0%	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K
	Output Current	0	0.281A	0.542A	0.801A	1.062A	1.322A	1.582A	1.842A	2.100A	2.359A	2.618A
	%	0%	10.41%	20.07%	29.67%	39.33%	48.96%	58.59%	68.22%	77.78%	87.37%	96.96%

TEST RESULT: OK

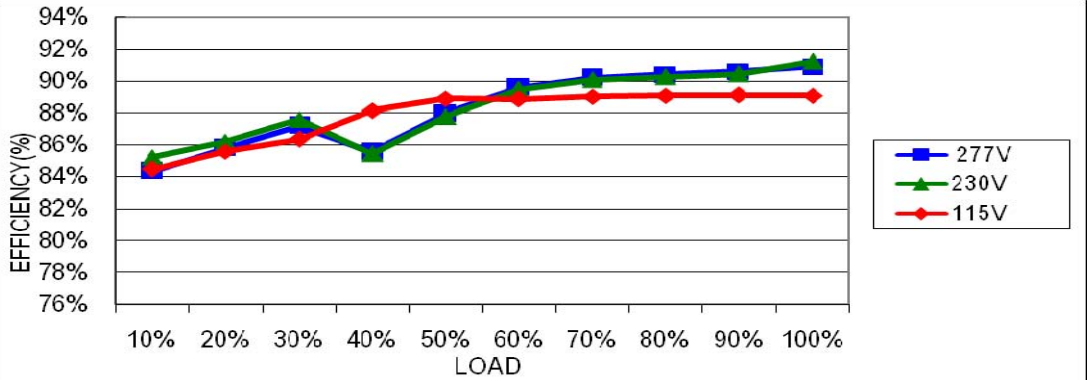
8	<p>DIMMING OPERATION (primary side;for DA-Type)</p>	<p>※DALI Interface          ·Apply DALI signal between DA+ and DA-.          ·DALI protocol comprises 16 groups and 64 addresses.          ·First step is fixed at 8% of output.</p> <p>I/P: 230 VAC          O/P: DIMMING TEST          Ta: 25°C          TEST RESULT: OK</p>
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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: FULL LOAD Ta: 25°C	87V~305V
			I/P: (1)LOW-LINE-3V=87 V HIGH-LINE+10V=315 V O/P: FULL/MIN LOAD ON: 30 Sec OFF: 30 Sec 10MIN (2)230VAC ON: 0.5 Sec OFF: 0.5 Sec 20MIN ( POWER ON/OFF NO DAMAGE )	TEST: OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P: 100 VAC ~305 VAC O/P: FULL-MIN LOAD Ta: 25°C	TEST: OK
3	AC CURRENT	1.1A/115VAC 0.5A/230VAC 0.45A/277VAC	I/P: 115 VAC I/P: 230 VAC I/P: 277 VAC O/P: FULL LOAD/75% LOAD Ta: 25°C	I =0.958A/ 115VAC I =0.474A/ 230VAC I =0.397A/ 277VAC
4	LEAKAGE CURRENT	< 0.75mA / 277VAC	I/P: 277 VAC O/P: NO LOAD Ta: 25°C	L-FG: 0.600 mA N-FG: 0.596 mA
5	INRUSH CURRENT(Typ)	60A/230VAC Twidth =415us measured at 50% Ipeak COLD START	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	I =55.6A/ 230VAC Twidth =356 us

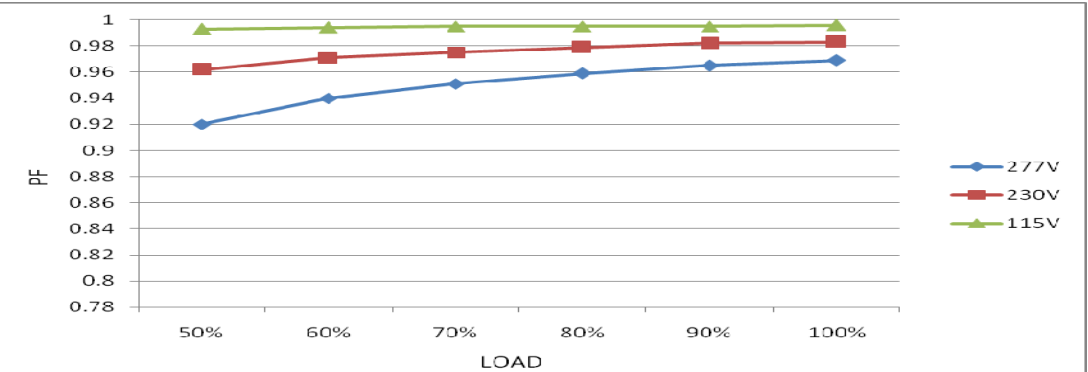
6	EFFICIENCY(Typ)	91%	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	91.23%
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EFFICIENCY vs LOAD



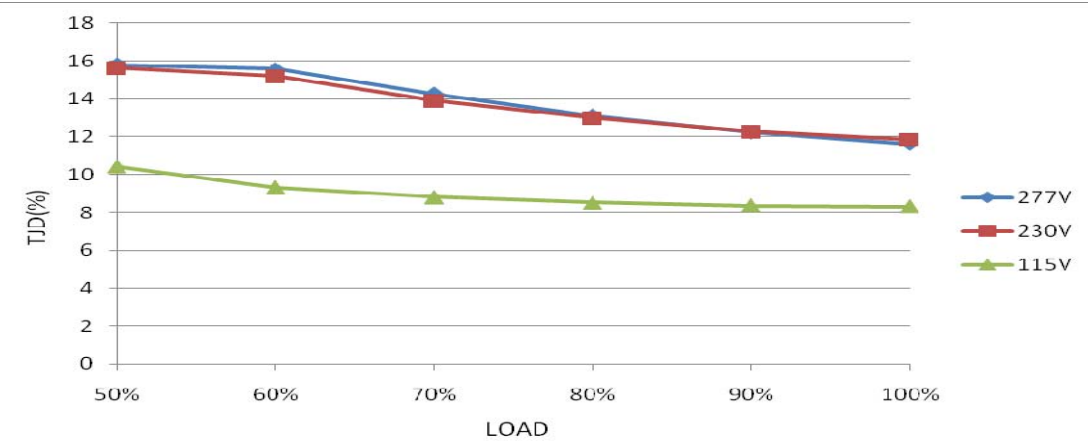
7	POWER FACTOR	0.96/ 115VAC 0.96/ 230VAC 0.94/ 277VAC	I/P: 115 VAC I/P: 230 VAC I/P: 277 VAC O/P: FULL LOAD Ta: 25°C	PF=0.994 /115VAC PF=0.983 /230VAC PF=0.969 /277VAC
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P.F vs LOAD



8	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=9.32% @60% load /115VAC THD=15.19% @60% load /230VAC THD=13.66% @75% load /277VAC
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THD vs LOAD



## PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	95 % - 108 %	I/P: 100 VAC I/P: 230 VAC I/P: 305VAC O/P: TESTING Ta: 25°C	101.25 %/100 VAC 101.26%/ 230 VAC 101.30 %/ 305VAC Constant current limiting
2	OVER VOLTAGE PROTECTION	54V-63V	I/P: 90VAC I/P: 230VAC I/P: 305VAC O/P: NO LOAD Ta: 25°C	58.7 V/ 90VAC 58.7V/ 230VAC 58.7V/ 305VAC Shut down o/p voltage re-power on to recovery
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 230VAC O/P: FULL LOAD	O.T.P. Active Shut down o/p voltage re-power on to recovery

## COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q 1 Rated 700V/12A	I/P: High-Line +3V =308V 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
2	O/P Diode (MOSFET)	Q101 Rated 300V/20A	I/P: High-Line +3V =308V 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
3	Input Capacitor	C5 Rated 82u/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) 430 V (2) 422 V (3) 418 V
4	Control IC	U1 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
5	PFC Power Transistor	Q 2 Rated 600V/11A	I/P: High-Line +3V =308V 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

## 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: 4.2 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG: 0.6KVAC/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
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 < 100 mΩ	40 A / 2min Ta: 25°C / 70%RH	17 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 L-N: 4KV L,N-PE: 6KV Ta: 25°C	PASS
7	Test by certified Lab & Test Report Prepare			

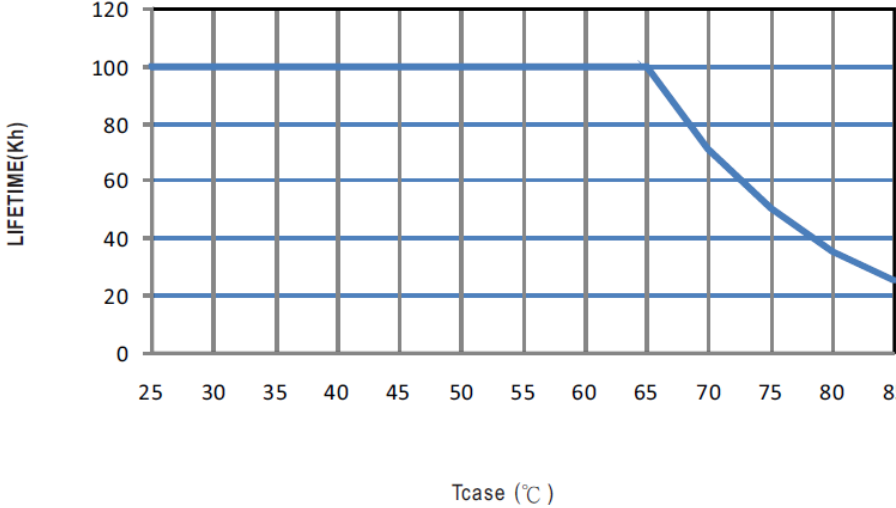
## RELIABILITY TEST

### ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																												
1	TEMPERATURE RISE TEST	MODEL: HBG-100-60 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=26.3 °C 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=59.0 °C																																														
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta=26.3 °C</th> <th>HIGH AMBIENT Ta=59.0 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>BD1</td><td>50.3°C</td><td>81.7°C</td></tr> <tr><td>2</td><td>C5</td><td>52.4°C</td><td>84.3°C</td></tr> <tr><td>3</td><td>Q2</td><td>57.3°C</td><td>89.8°C</td></tr> <tr><td>4</td><td>Q1</td><td>54.6°C</td><td>86.6°C</td></tr> <tr><td>5</td><td>U1</td><td>48.0°C</td><td>79.5°C</td></tr> <tr><td>6</td><td>T1</td><td>58.6°C</td><td>90.1°C</td></tr> <tr><td>7</td><td>Q101</td><td>56.5°C</td><td>87.8°C</td></tr> <tr><td>8</td><td>C106</td><td>51.9°C</td><td>83.0°C</td></tr> <tr><td>9</td><td>RTH2</td><td>47.9°C</td><td>79.1°C</td></tr> <tr><td>10</td><td>TC</td><td>43.0°C</td><td>73.8°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta=26.3 °C	HIGH AMBIENT Ta=59.0 °C	1	BD1	50.3°C	81.7°C	2	C5	52.4°C	84.3°C	3	Q2	57.3°C	89.8°C	4	Q1	54.6°C	86.6°C	5	U1	48.0°C	79.5°C	6	T1	58.6°C	90.1°C	7	Q101	56.5°C	87.8°C	8	C106	51.9°C	83.0°C	9	RTH2	47.9°C	79.1°C	10	TC	43.0°C	73.8°C
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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P: 305VAC/90VAC O/P: FULL /80% LOAD Ta= -45°C /-30°C	TEST: OK																																												
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60°C NO DAMAGE	I/P: 305VAC O/P: FULL LOAD Ta=60°C HUMIDITY= 95 %R.H	TEST: OK																																												
4	TEMPERATURE COEFFICIENT	±0.03 %/°C (0-50°C)	I/P: 230 VAC O/P: FULL LOAD	±0.003 %/°C (0-50°C)																																												
5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature: -45°C ~ +90°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		TEST: OK																																												
6	THERMAL SHOCK TEST	1. Thermal shock Temperature: -45°C ~ +65°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 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-100-24: SUPPOSE C103 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: MIN LOAD Ta= 60 °C LIFE TIME	(1) 587771 HRS (2) 58086 HRS (3) 74924 HRS (4) 81021 HRS																												
9	MTBF	Conducted by Parts Stress Analysis Prediction 985.6K hrs min. Telcordia SR-332 (Bellcore) 300.0K hrs min. MIL-HDBK-217F (25 °C)																													
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 50000 hours @ Tc 75 °C   <table border="1"> <caption>Graph Data: Lifetime (Kh) vs Tcase (°C)</caption> <thead> <tr> <th>Tcase (°C)</th> <th>Lifetime (Kh)</th> </tr> </thead> <tbody> <tr><td>25</td><td>100</td></tr> <tr><td>30</td><td>100</td></tr> <tr><td>35</td><td>100</td></tr> <tr><td>40</td><td>100</td></tr> <tr><td>45</td><td>100</td></tr> <tr><td>50</td><td>100</td></tr> <tr><td>55</td><td>100</td></tr> <tr><td>60</td><td>100</td></tr> <tr><td>65</td><td>100</td></tr> <tr><td>70</td><td>70</td></tr> <tr><td>75</td><td>50</td></tr> <tr><td>80</td><td>35</td></tr> <tr><td>85</td><td>25</td></tr> </tbody> </table>		Tcase (°C)	Lifetime (Kh)	25	100	30	100	35	100	40	100	45	100	50	100	55	100	60	100	65	100	70	70	75	50	80	35	85	25
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TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	SHENJW/ZHUOKB	SKY	LIUWY