



Test Report: HBG-100-24

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

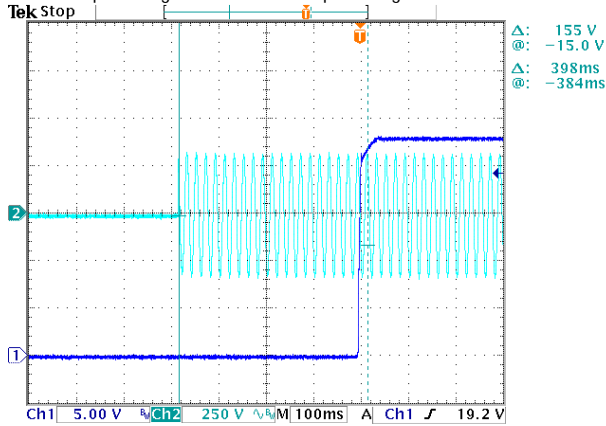
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONSTANT CURRENT REGION	14.4V-24V	I/P: 230VAC O/P: LED MODE Ta: 25°C	14.4V-24V
2	OUTPUT CURRENT ADJUST RANGE (For A-Type only)	2.4A-4A	I/P: 230VAC O/P: SETTING Ta: 25°C	2.3 A- 4.4 A
3	CURRENT RIPPLE	5.0% max. @rated current	I/P: 230VAC O/P: FULL/MIN LOAD Ta: 25°C	2.34%
4	CURRENT TOLERANCE	<±5.0%	I/P: 230VAC O/P: FULL/MIN LOAD Ta: 25°C	<5%
5	OPEN CIRCUIT VOLTAGE (max)	25V	I/P: 230VAC O/P: NO LOAD Ta: 25°C	24.71V
6	SET UP TIME	500ms/230VAC 2000ms/115VAC	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	398ms/230VAC 264ms/115VAC

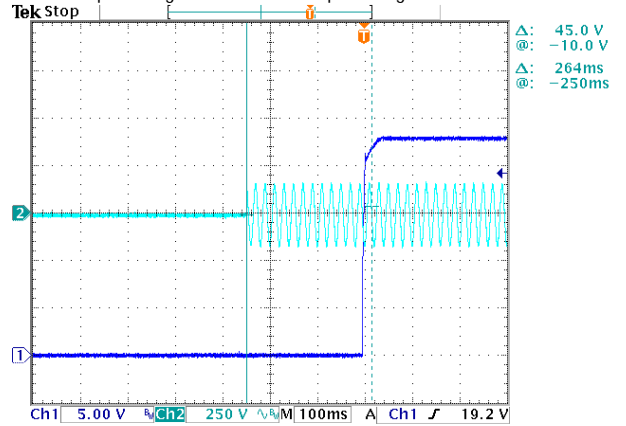
INPUT=230VAC/50HZ @ FULL LOAD

CH1: Output Voltage CH2: AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

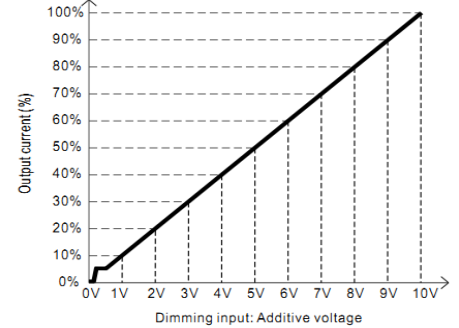
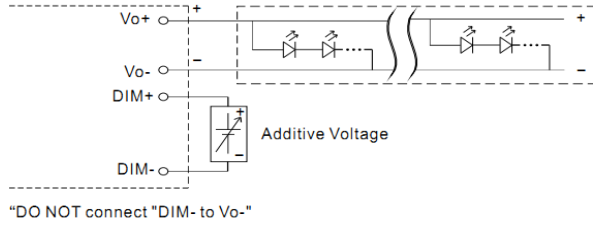
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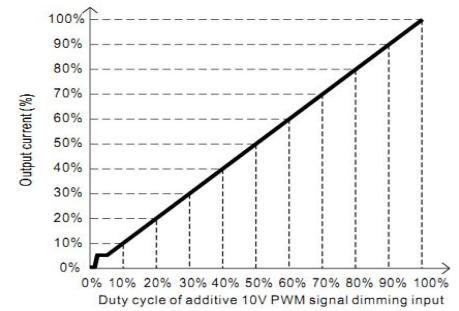
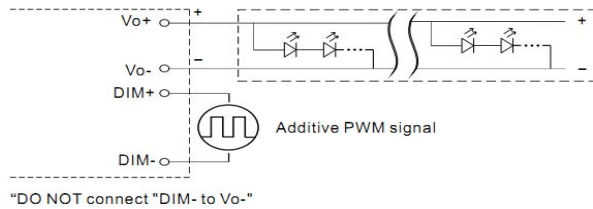
7 DIMMING OPERATION (for B-Type)

- 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.)

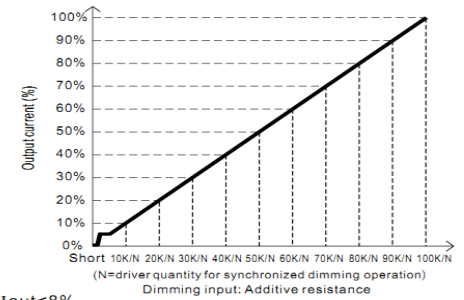
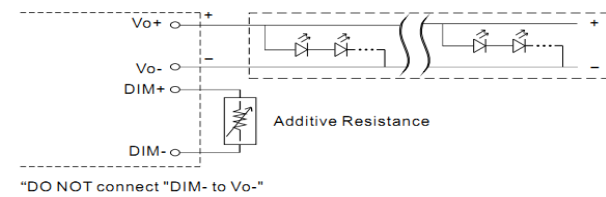
◎ Applying additive 0 ~ 10VDC



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



◎ Applying additive resistance:



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	0.518A	0.919A	1.337A	1.738A	2.131A	2.530A	2.924A	3.326A	3.725A	4.055A
	%	0%	12.96%	22.99%	33.42%	43.45%	53.28%	63.26%	73.11%	83.15%	93.13%	101.4%
2	PWM(100Hz)	0V	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Output Current	0	0.556A	0.948A	1.358A	1.745A	2.134A	2.520A	2.905A	3.295A	3.680A	4.028A
	%	0%	13.90%	23.70%	33.96%	43.62%	53.35%	62.99%	72.63%	82.37%	92.01%	100%
3	R	0%	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K
	Output Current	0	0.505A	0.908A	1.293A	1.674A	2.054A	2.434A	2.817A	3.198A	3.581A	3.963A
	%	0%	12.62%	22.70%	32.33%	41.84%	51.35%	60.87%	70.42%	79.95%	89.51%	99.67%

TEST RESULT: OK

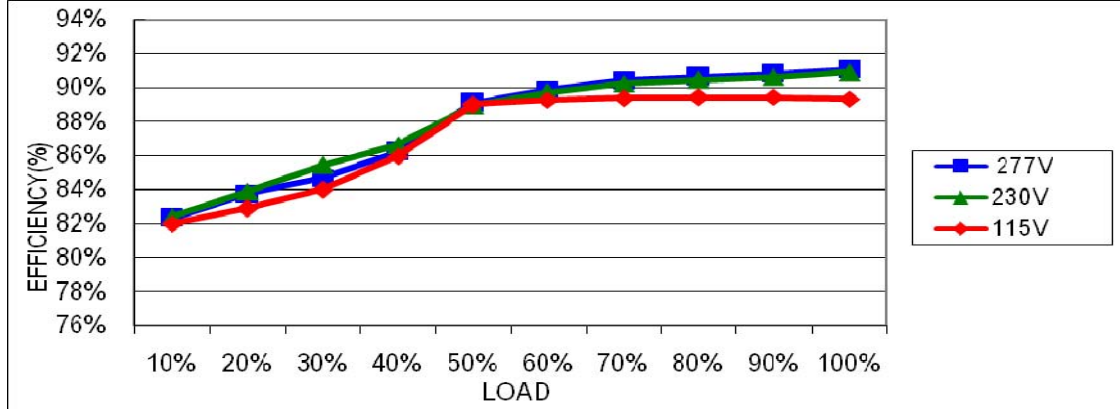
8	DIMMING OPERATION (primary side;for DA-Type)	※DALI Interface ·Apply DALI signal between DA+ and DA-. ·DALI protocol comprises 16 groups and 64 addresses. ·First step is fixed at 8% of output. I/P: 230 VAC O/P: DIMMING TEST Ta: 25°C TEST RESULT: OK
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INPUT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

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC-305VAC	I/P: TESTING O/P: FULL LOAD Ta: 25°C 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)	87V-305V 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=0.929A/ 115VAC I=0.461A/ 230VAC I=0.385A/ 277VAC
4	LEAKAGE CURRENT	< 0.75mA / 277VAC	I/P: 277 VAC O/P: NO LOAD Ta: 25°C	L-FG: 0.579 mA N-FG: 0.577 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=51.5A/ 230VAC Twidth =370us

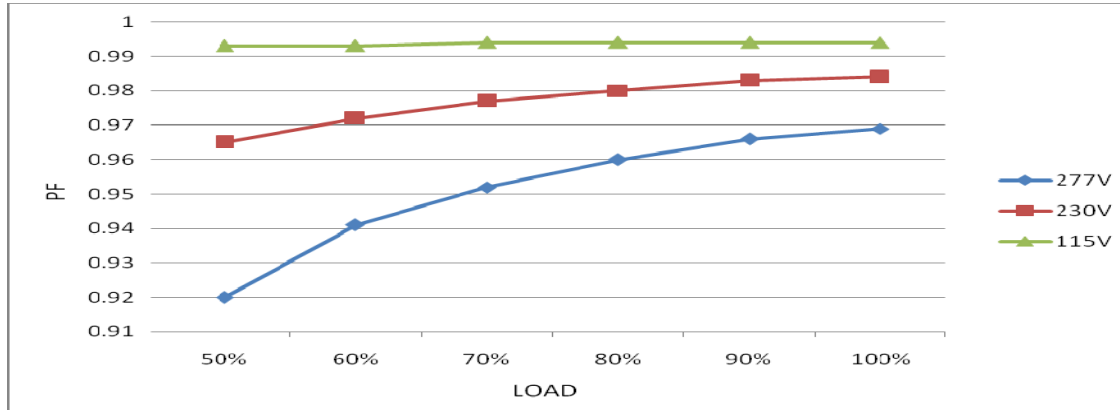
6	EFFICIENCY(Typ)	90.5%	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	90.90%
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EFFICIENCY vs LOAD



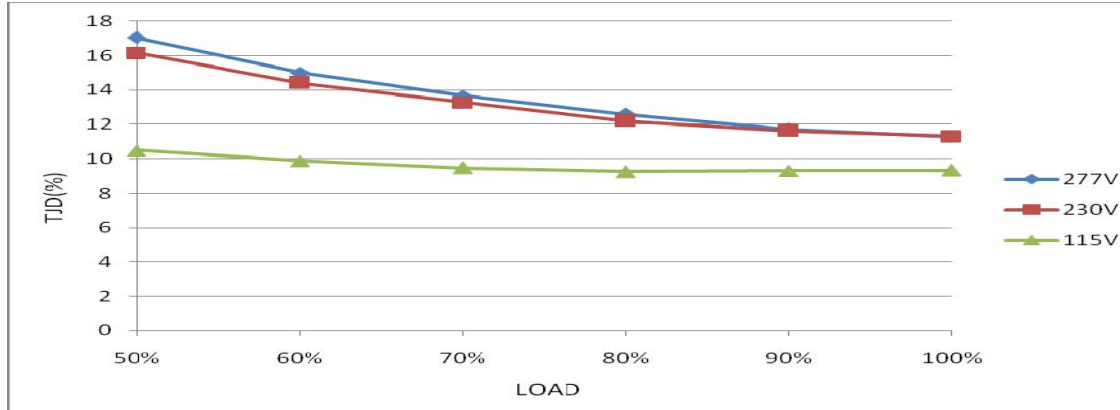
7	POWER FACTOR	0.96/ 115VAC 0.96/ 230VAC 0.94/ 277VAC	I/P: 115 VAC I/P: 230 VAC I/P: 277 VAC O/P: FULL LOAD Ta: 25°C	PF=0.994 /115VAC PF=0.984 /230VAC PF=0.969 /277VAC
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P.F vs LOAD



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=9.87% @60% load /115VAC THD=14.41% @60% load /230VAC THD=13.10% @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	100.34 %/100 VAC 100.36 %/ 230 VAC 100.40 %/ 305VAC Constant current limiting
1	OVER VOLTAGE PROTECTION	28V-35V	I/P: 90VAC I/P: 230VAC I/P: 305VAC O/P: NO LOAD Ta: 25°C	30.4 V/ 90VAC 30.4 V/ 230VAC 30.4 V/ 305VAC Shut down o/p voltage re-power on to recovery
2	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) 602 V (2) 480 V (3) 600 V
2	O/P Diode (MOSFET)	Q101 Rated 120V/80A	I/P: High-Line +3V =308V O/P: (1) FULL LOAD Turn on (2) Output Short (3) FULL LOAD continue Ta: 25°C	(1) 98.6 V (2) 78.0 V (3) 96.4 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) 442 V (2) 440 V (3) 420 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) 21.5 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) 486 V (2) 420 V (3) 438 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: 3.812 mA I/P-FG: 3.798 mA O/P-FG: 3.056 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

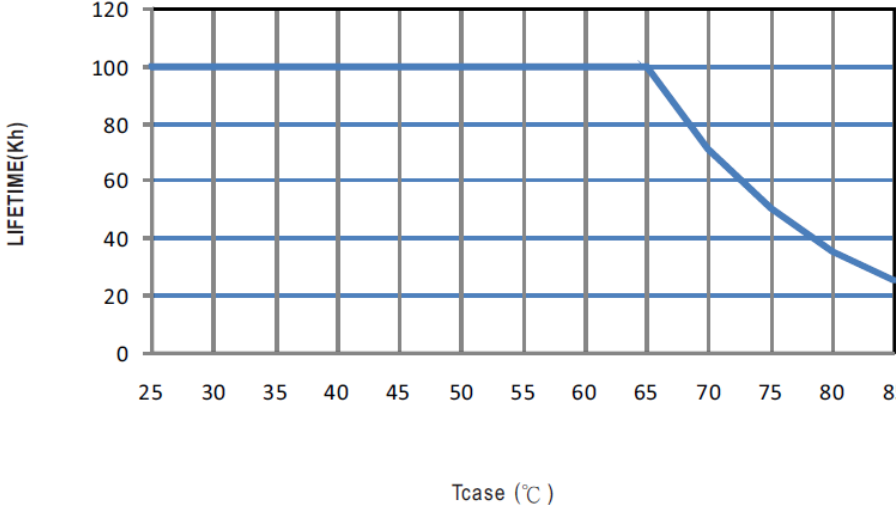
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 Class C	I/P: 230VAC/50HZ O/P: FULL/60% LOAD Ta: 25°C	PASS
2	CONDUCTION	EN55015	I/P: 230 VAC (50HZ) O/P: FULL LOAD Ta: 25°C	PASS Test by certified Lab
3	RADIATION	EN55015	I/P: 230 VAC (50HZ) O/P: FULL LOAD Ta: 25°C	PASS Test by certified 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-100-24 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>52.9°C</td><td>83.3°C</td></tr> <tr><td>2</td><td>C5</td><td>54.1°C</td><td>84.9°C</td></tr> <tr><td>3</td><td>Q2</td><td>55.3°C</td><td>86.3°C</td></tr> <tr><td>4</td><td>Q1</td><td>59.1°C</td><td>90.1°C</td></tr> <tr><td>5</td><td>U1</td><td>50.1°C</td><td>81.0°C</td></tr> <tr><td>6</td><td>T1</td><td>59.6°C</td><td>89.8°C</td></tr> <tr><td>7</td><td>Q101</td><td>55.3°C</td><td>85.9°C</td></tr> <tr><td>8</td><td>C106</td><td>53.5°C</td><td>84.0°C</td></tr> <tr><td>9</td><td>RTH2</td><td>47.3°C</td><td>77.5°C</td></tr> <tr><td>10</td><td>TC</td><td>44.2°C</td><td>74.7°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta=26.3 °C	HIGH AMBIENT Ta=59.0 °C	1	BD1	52.9°C	83.3°C	2	C5	54.1°C	84.9°C	3	Q2	55.3°C	86.3°C	4	Q1	59.1°C	90.1°C	5	U1	50.1°C	81.0°C	6	T1	59.6°C	89.8°C	7	Q101	55.3°C	85.9°C	8	C106	53.5°C	84.0°C	9	RTH2	47.3°C	77.5°C	10	TC	44.2°C	74.7°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	±0.005 %/°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	<p>HBG-100-24: SUPPOSE C103 IS THE MOST CRITICAL COMPONENT</p> <p>(1) I/P: 230VAC O/P: FULL LOAD Ta= 25 °C LIFE TIME</p> <p>(2) I/P: 230VAC O/P: FULL LOAD Ta= 60 °C LIFE TIME</p> <p>(3) I/P: 230VAC O/P: 75% LOAD Ta= 60 °C LIFE TIME</p> <p>(4) I/P: 230VAC O/P: MIN LOAD Ta= 60 °C LIFE TIME</p>	<p>(1) 271950 HRS</p> <p>(2) 28000 HRS</p> <p>(3) 43609 HRS</p> <p>(4) 53804 HRS</p>																												
9	MTBF	<p>Conducted by Parts Stress Analysis Prediction</p> <p>985.6K hrs min. Telcordia SR-332 (Bellcore)</p> <p>300.0K hrs min. MIL-HDBK-217F (25 °C)</p>																													
10	DMTBF/Accelerated Life Test	<p>Demonstration Mean Time Between Failure (Expected Life):</p> <p>Above 50000 hours @ Tc 75 °C</p>  <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