Test Report： HBG-100-60

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

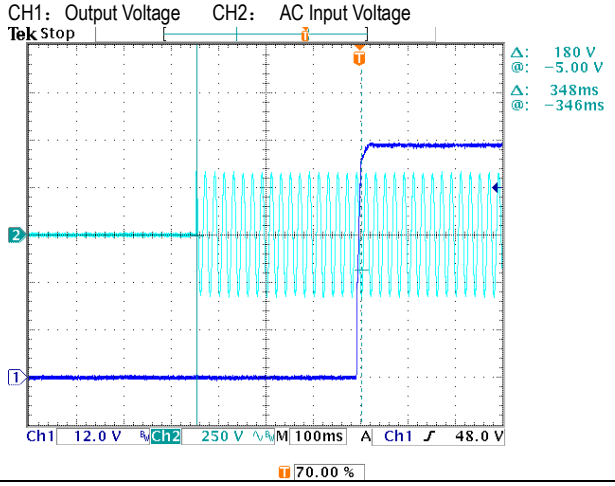
■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONSTANT CURRENT REGION	36V~60V	I/P： 230VAC O/P：LED MODE Ta：25℃	36V~60V
2	OUTPUT CURRENT ADJUST RANGE (For A-Type only)	1.0A~1.6A	I/P： 230VAC O/P：SETTING Ta：25℃	0.9 A~ 1.7 A
3	CURRENT RIPPLE	5.0% max.@rated current	I/P： 230VAC O/P：FULL/MIN LOAD Ta：25℃	2.75%
4	CURRENT TOLERANCE	<±5.0%	I/P： 230VAC O/P：FULL/MIN LOAD Ta：25℃	<5%
5	OPEN CIRCUIT VOLTAGE (max)	62V	I/P： 230VAC O/P：NO LOAD Ta：25℃	60.7V
6	SET UP TIME	500ms/230VAC 2000ms/115VAC	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	348ms/230VAC 296ms/115VAC

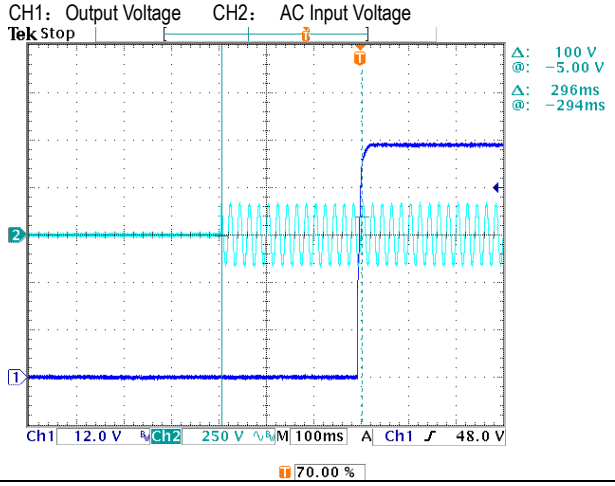
INPUT=230VAC/50HZ @ FULL LOAD

CH1：Output Voltage CH2： AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

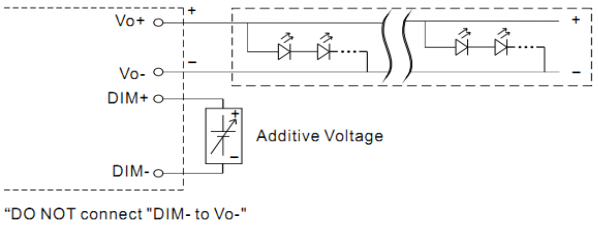
CH1：Output Voltage CH2： AC Input Voltage



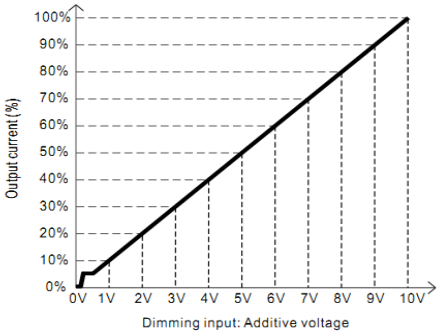
7 DIMMING OPERATION (for B-Type)

- 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.)

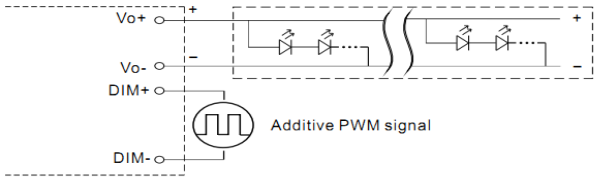
◎ Applying additive 0 ~ 10VDC



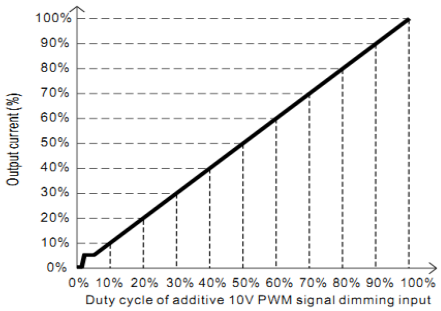
"DO NOT connect "DIM- to Vo-"



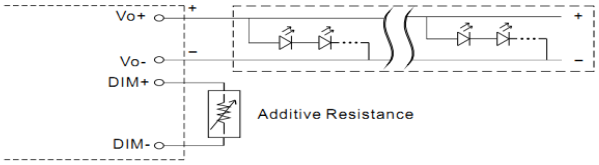
◎ Applying additive 10V PWM signal (frequency range 100Hz ~ 3KHz):



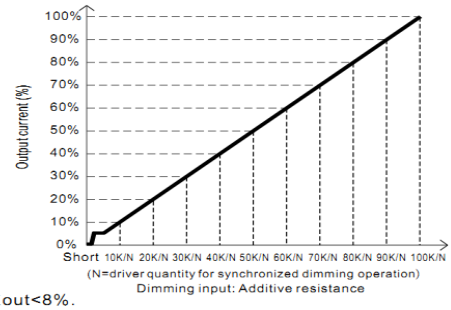
"DO NOT connect "DIM- to Vo-"



◎ 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℃

	V	Short	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
1	Output Current	0	0.175A	0.339A	0.497A	0.663A	0.826A	0.993A	1.154A	1.321A	1.467A	1.633A
	%	0%	10.94%	21.19%	31.06%	41.44%	51.63%	62.06%	72.13%	82.56%	91.69%	102.1%
2	PWM(100Hz)	0V	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Output Current	0	0.188A	0.347A	0.508A	0.661A	0.822A	0.981A	1.141A	1.302A	1.462A	1.607A
	%	0%	11.75%	21.69%	31.75%	41.31%	51.38%	61.31%	71.31%	81.38%	91.38%	100.4%
3	R	0%	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K
	Output Current	0	0.170A	0.329A	0.489A	0.645A	0.806A	0.968A	1.130A	1.293A	1.458A	1.622A
	%	0%	10.63%	20.56%	30.56%	40.31%	50.38%	60.50%	70.63%	80.81%	91.13%	101.4%

TEST RESULT：OK

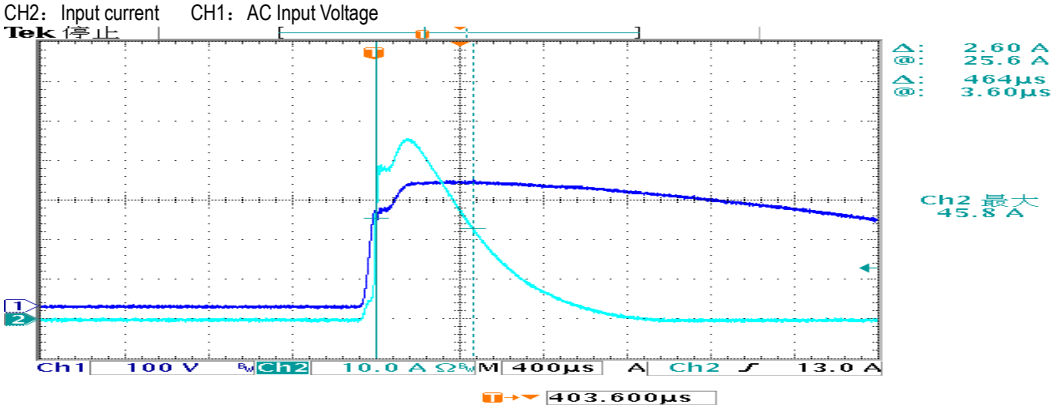
8	DIMMING OPERATION (primary side;for DA-Type)	※DALI Interface ·Apply DALI signal between DA+ and DA-. ·DALI protocol comprises 16 groups and 64 addresses. ·Firse step is fixed at 8% of output. I/P： 230 VAC O/P：DIMMING TEST Ta：25℃ TEST RESULT：OK

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℃	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℃	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℃	I =0.937A/ 115VAC I =0.447A/ 230VAC I =0.391A/ 277VAC
4	LEAKAGE CURRENT	< 0.75mA / 277VAC	I/P： 277 VAC O/P：NO LOAD Ta：25℃	L-FG： 0.589 mA N-FG： 0.558 mA
5	INRUSH CURRENT(Typ)	60A/230VAC Twidth =550us measured at 50% Ipeak COLD START	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I =45.8A/ 230VAC Twidth =464 us

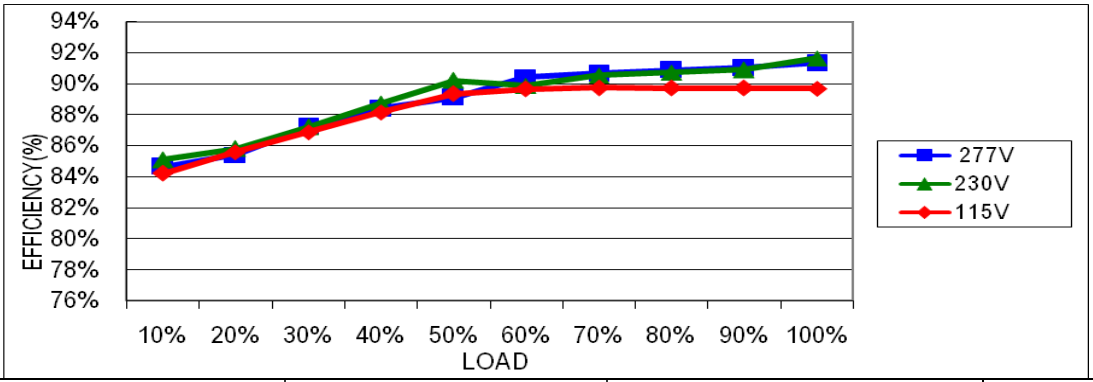
INPUT=230VAC/50HZ @ FULL LOAD

CH2：Input current CH1：AC Input Voltage



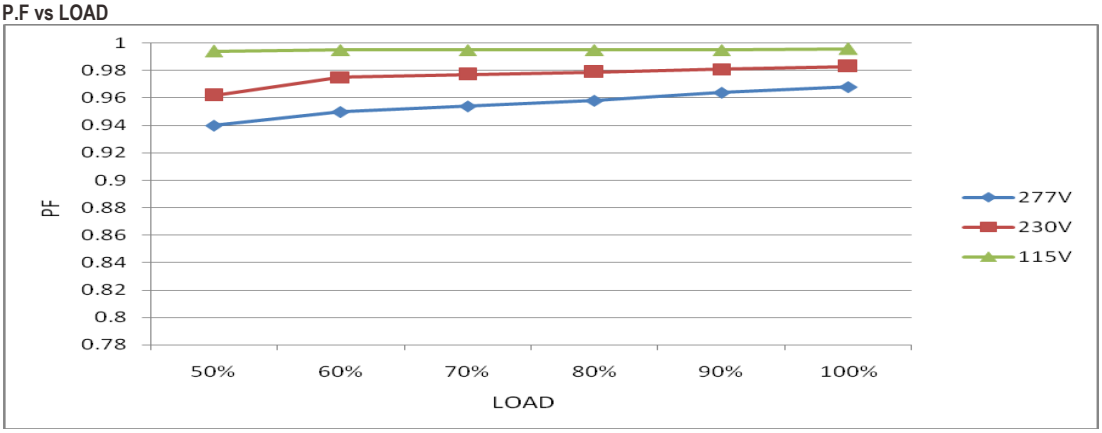
6	EFFICIENCY(Typ)	91.5%	I/P： 230VAC O/P：FULL LOAD Ta：25℃	91.64%

EFFICIENCY vs LOAD



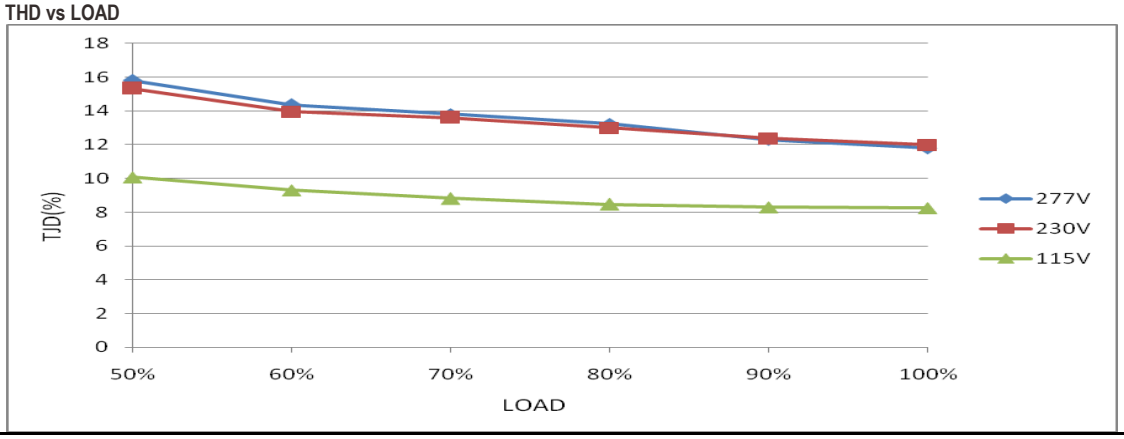
7	POWER FACTOR	0.96/ 115VAC 0.96/ 230VAC 0.94/ 277VAC	I/P： 115 VAC I/P： 230 VAC I/P： 277 VAC O/P：FULL LOAD Ta：25℃	PF=0.996 /115VAC PF=0.983 /230VAC PF=0.968 /277VAC

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℃	THD=9.87% @60% load /115VAC THD=14.41% @60% load /230VAC THD=13.10% @75% load /277VAC

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℃	101.56%/100 VAC 101.33%/ 230 VAC 101.65 %/ 305VAC Constant current limiting
2	OVER VOLTAGE PROTECTION	65V~75V	I/P： 90VAC I/P： 230VAC I/P： 305VAC O/P：NO LOAD Ta：25℃	69.1 V/ 90VAC 69.1V/ 230VAC 69.1V/ 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℃	(1) 600 V (2) 462 V (3) 598 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℃	(1) 234 V (2) 177 V (3) 233 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℃	(1) 444 V (2) 440 V (3) 436 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℃	(1) 22.2 V (2) 22.2 V (3) 22.2 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℃	(1) 454 V (2) 438 V (3) 448 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℃	I/P-O/P：3.831 mA I/P-FG： 3.803 mA O/P-FG：3.084 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℃	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℃ /70% RH	18 mΩ

E.M.C TEST

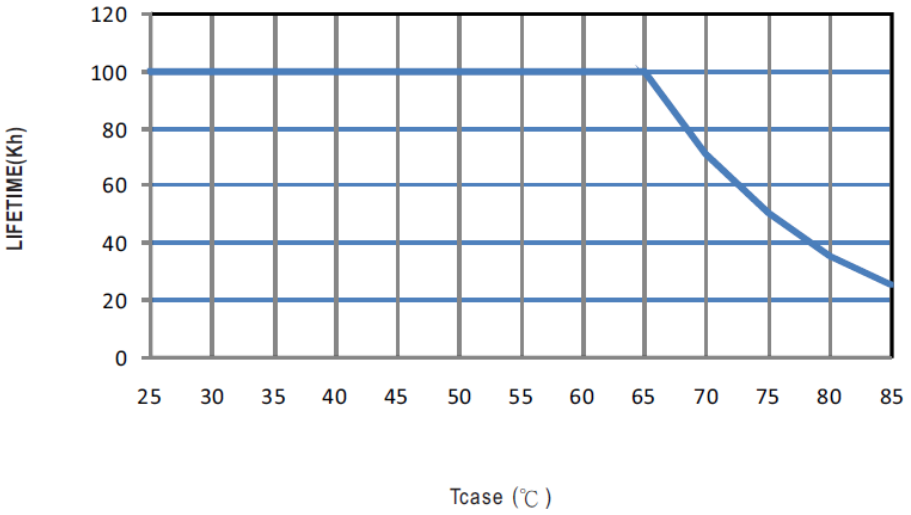
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 Class C	I/P：230VAC/50HZ O/P：FULL/60% LOAD Ta：25℃	PASS
2	CONDUCTION	EN55015	I/P：230 VAC (50HZ) O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab
3	RADIATION	EN55015	I/P：230 VAC (50HZ) O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR：8KV Contact：4KV	I/P：230 VAC/50HZ O/P：FULL LOAD Ta：25℃	PASS
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT：1KV	I/P： 230VAC/50HZ O/P：FULL LOAD Ta：25℃	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℃	PASS
7	Test by certified Lab ＆ Test Report Prepare			

■ RELIABILITY TEST

ENVIRONMENT TEST

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL： HBG-100-60
1. ROOM AMBIENT BURN-IN：2 HRS
I/P： 230VAC O/P：FULL LOAD Ta=26.3 ℃
2. HIGH AMBIENT BURN-IN： 2 HRS
I/P： 230VAC O/P：FULL LOAD Ta=59.0 ℃
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta=26.3 ℃</th><th>HIGH AMBIENT Ta=59.0 ℃</th></tr>
<tr><td>1</td><td>BD1</td><td>50.3℃</td><td>81.7℃</td></tr>
<tr><td>2</td><td>C5</td><td>52.4℃</td><td>84.3℃</td></tr>
<tr><td>3</td><td>Q2</td><td>57.3℃</td><td>89.8℃</td></tr>
<tr><td>4</td><td>Q1</td><td>54.6℃</td><td>86.6℃</td></tr>
<tr><td>5</td><td>U1</td><td>48.0℃</td><td>79.5℃</td></tr>
<tr><td>6</td><td>T1</td><td>58.6℃</td><td>90.1℃</td></tr>
<tr><td>7</td><td>Q101</td><td>56.5℃</td><td>87.8℃</td></tr>
<tr><td>8</td><td>C106</td><td>51.9℃</td><td>83.0℃</td></tr>
<tr><td>9</td><td>RTH2</td><td>47.9℃</td><td>79.1℃</td></tr>
<tr><td>10</td><td>TC</td><td>43.0℃</td><td>73.8℃</td></tr>
</table></td></tr>
<tr><td>2</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 305VAC/90VAC
O/P：FULL /80% LOAD
Ta= -45℃ / -30℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 60℃
NO DAMAGE</td><td>I/P： 305VAC
O/P：FULL LOAD
Ta=60℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>TEMPERATURE
COEFFICIENT</td><td>±0.03 %/℃(0~50℃)</td><td>I/P： 230 VAC
O/P：FULL LOAD</td><td>±0.003 %/℃(0~50℃)</td></tr>
<tr><td>5</td><td>STORAGE TEMPERATURE TEST</td><td colspan="2">1. Thermal shock Temperature： -45℃~ +90℃
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</td><td>TEST：OK</td></tr>
<tr><td>6</td><td>THERMAL SHOCK TEST</td><td colspan="2">1. Thermal shock Temperature： -45℃~ +65℃
2. Temperature change rate ： 25℃ / 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</td><td>TEST：OK</td></tr>
<tr><td>7</td><td>VIBRATION TEST</td><td colspan="2">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℃</td><td>TEST：OK</td></tr>
</table>

8	CAPACITOR LIFE CYCLE	HBG-100-60：SUPPOSE C103 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 230VAC O/P：FULL LOAD Ta= 60 ℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta= 60 ℃ LIFE TIME (4) I/P： 230VAC O/P：MIN LOAD Ta= 60 ℃ LIFE TIME	(1) 587771 HRS (2) 58086 HRS (3) 74924 HRS (4) 81021 HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 2433.4K hrs min. Telcordia SR-332 (Bellcore) ; 299.3K hrs min. MIL-HDBK-217F (25℃)	
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life)： Above 50000 hours @ Tc 75℃	



TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	SHENJW/ZHUOKB	SKY	LIUWY