



Test Report: HBG-240-24

240W 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

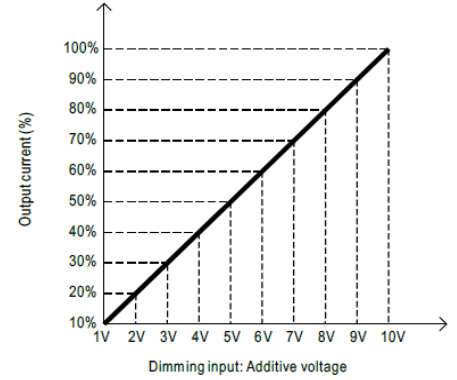
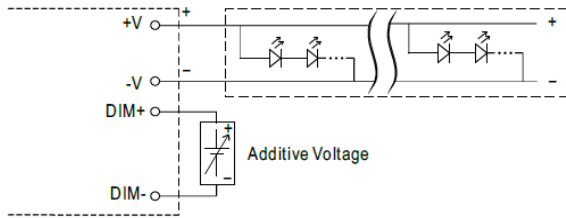
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONSTANT CURRENT REGION	14.4 V~ 24 V	I/P: 230VAC O/P: LED MODE Ta: 25°C	14.4V~ 24 V
2	OUTPUT CURRENT ADJUST RANGE (For A-Type)	6A~10A	I/P: 230VAC O/P: SETTING Ta: 25°C	4.861A~10.52A
3	OUTPUT VOLTAGE TOLERANCE	-2%~+2%	I/P: 90VAC / 305VAC O/P: FULL/ NO LOAD Ta: 25°C	-0.284%~ 0.259%
4	LINE REGULATION	-0.5%~+0.5%	I/P: 90VAC ~ 305VAC O/P: 80% ~ FULL LOAD Ta: 25°C	0%~ 0 %
5	LOAD REGULATION	-0.5%~+0.5%	I/P: 230VAC O/P: FULL/ NO LOAD Ta: 25°C	0%~ 0.025%
6	OVER/UNDERSHOOT TEST	<±5 %	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	<5 %
7	RIPPLE & NOISE (Max)	150mVp-p	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	25 mVp-p
8	SET UP TIME(Max)	230VAC/ 500ms 115VAC/ 2500ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 444 ms 115VAC/ 1717 ms
9	RISE TIME (Max)	230VAC/ 120ms 115VAC/ 120ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 35.46 ms 115VAC/ 35.46 ms
10	HOLD UP TIME(Typ)	230VAC/ 15ms 115VAC/ 15ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 31.39 ms 115VAC/ 31.45 ms
11	DYNAMIC LOAD	V1: 2400 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) 1820mVp-p (2) 488mVp-p

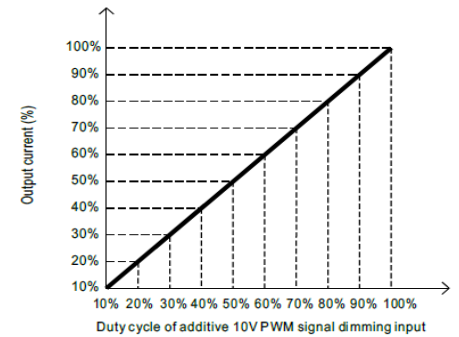
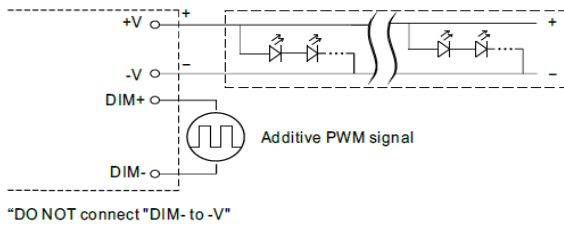
12 DIMMING OPERATION (for B-Type)

- 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.
- Direct connecting to LEDs is suggested. It is not suitable to be used with additional drivers.
- Dimming source current from power supply: 100 μ A (typ.)

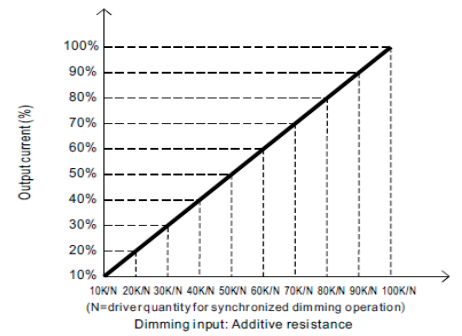
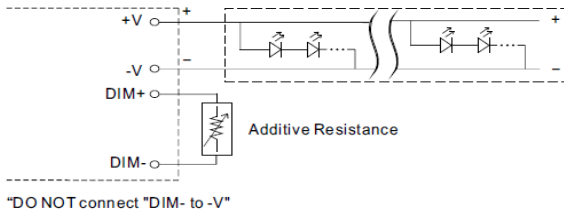
⊙ Applying additive 1 ~ 10VDC



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



⊙ Applying additive resistance:



I/P: 230 VAC

O/P: DIMMING TEST

Ta: 25°C

	DIMMING	Short	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
1	Output Current	0	1.073A	2.125A	3.196A	4.195A	5.195A	6.013A	7.036A	8.023A	9.016A	9.908A
	%	0%	10.73%	21.25%	31.96%	41.95%	51.95%	60.13%	70.36%	80.23%	90.16%	99.08%
	PWM(100Hz)	0V	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
2	Output Current	0	1.117A	2.108A	3.106A	4.069A	5.038A	6.007A	6.984A	7.947A	8.927A	9.837A
	%	0%	11.17%	21.08%	31.06%	40.69%	50.38%	60.07%	69.84%	79.47%	89.27%	98.37%
	R	0%	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K
3	Output Current	0	1.071A	2.119A	3.195A	4.196A	5.186A	6.208A	7.204A	8.208A	9.175A	9.861A
	%	0%	10.71%	21.19%	31.95%	41.96%	51.86%	62.08%	72.04%	82.08%	91.75%	98.61%

TEST RESULT: OK

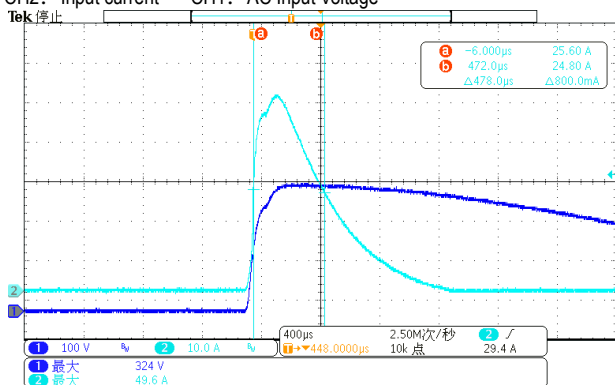
13	DALI DIMMING OPERATION (primary side; for DA-Type)	※DALI Interface ·Apply DALI signal between DA+ and DA-. ·DALI protocol comprises 16 groups and 64 addresses. ·First step is fixed at 8% of output. I/P: 230 VAC O/P: DIMMING TEST Ta: 25°C TEST RESULT: OK
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INPUT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

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~305VAC	I/P: TESTING O/P: 80% ~FULL LOAD Ta: 25°C	87 V~ 305 V
			(1)I/P: LOW-LINE-3V=87 V HIGH-LINE+10V=315 V O/P: 80% ~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)	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	2.5A/115VAC 1.3A/230VAC 1.2A/277VAC	I/P: 115 VAC I/P: 230 VAC I/P: 277 VAC O/P: FULL LOAD Ta: 25°C	I = 2.20 A/ 115VAC I = 1.09 A/ 230VAC I = 0.94 A/ 277VAC
4	LEAKAGE CURRENT	< 0.75mA / 277VAC	I/P: 277 VAC O/P: NO LOAD Ta: 25°C	L-FG: 0.391 mA N-FG: 0.400 mA
5	INRUSH CURRENT(Typ)	230V/ 75A Twidth =680us measured at 50% Ipeak COLD START	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	I = 49.6 A/ 230VAC Twidth =478 us

INPUT=230VAC/50HZ @ FULL LOAD

CH2: Input current CH1: AC Input Voltage



6	EFFICIENCY(Typ)	92.5%	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	93.19%																																												
<p>EFFICIENCY vs LOAD</p> <table border="1"> <caption>Efficiency vs Load Data</caption> <thead> <tr> <th>LOAD (%)</th> <th>277V (%)</th> <th>230V (%)</th> <th>115V (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>79.5</td><td>79.0</td><td>78.5</td></tr> <tr><td>20%</td><td>80.5</td><td>80.0</td><td>79.5</td></tr> <tr><td>30%</td><td>82.5</td><td>82.0</td><td>81.5</td></tr> <tr><td>40%</td><td>86.5</td><td>86.0</td><td>85.0</td></tr> <tr><td>50%</td><td>88.5</td><td>88.0</td><td>87.0</td></tr> <tr><td>60%</td><td>88.5</td><td>88.0</td><td>88.0</td></tr> <tr><td>70%</td><td>89.5</td><td>89.0</td><td>89.0</td></tr> <tr><td>80%</td><td>89.5</td><td>89.0</td><td>89.0</td></tr> <tr><td>90%</td><td>90.5</td><td>90.0</td><td>89.5</td></tr> <tr><td>100%</td><td>92.5</td><td>92.0</td><td>91.5</td></tr> </tbody> </table>					LOAD (%)	277V (%)	230V (%)	115V (%)	10%	79.5	79.0	78.5	20%	80.5	80.0	79.5	30%	82.5	82.0	81.5	40%	86.5	86.0	85.0	50%	88.5	88.0	87.0	60%	88.5	88.0	88.0	70%	89.5	89.0	89.0	80%	89.5	89.0	89.0	90%	90.5	90.0	89.5	100%	92.5	92.0	91.5
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7	POWER FACTOR	0.98/ 115VAC 0.95/ 230VAC 0.93/ 277VAC	I/P: 115 VAC I/P: 230 VAC I/P: 277 VAC O/P: FULL LOAD Ta: 25°C	PF= 0.993 / 115VAC PF= 0.973 / 230VAC PF= 0.945 / 277VAC																																												
<p>P.F vs LOAD</p> <table border="1"> <caption>P.F vs Load Data</caption> <thead> <tr> <th>LOAD (%)</th> <th>277V</th> <th>230V</th> </tr> </thead> <tbody> <tr><td>50%</td><td>0.84</td><td>0.93</td></tr> <tr><td>60%</td><td>0.89</td><td>0.95</td></tr> <tr><td>70%</td><td>0.91</td><td>0.96</td></tr> <tr><td>80%</td><td>0.92</td><td>0.96</td></tr> <tr><td>90%</td><td>0.94</td><td>0.97</td></tr> <tr><td>100%</td><td>0.94</td><td>0.97</td></tr> </tbody> </table>					LOAD (%)	277V	230V	50%	0.84	0.93	60%	0.89	0.95	70%	0.91	0.96	80%	0.92	0.96	90%	0.94	0.97	100%	0.94	0.97																							
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8	TOTAL HARMONIC DISTORTION	THD < 20% (@load ≥ 60% / 115VAC, 230VAC; @load ≥ 80% / 277VAC)	I/P: 115 VAC / 60% LOAD I/P: 230 VAC / 60% LOAD I/P: 277 VAC / 80% LOAD Ta: 25°C	THD=9.18% @60% load /115VAC THD=13.43% @60% load /230VAC THD=14.19% @80% load /277VAC																																												
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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	100.14 %/ 90VAC 100.24 %/ 230VAC 100.54%/ 305VAC Constant Current Limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	27V~34V	I/P: 90VAC I/P: 230VAC I/P: 305VAC O/P: NO LOAD Ta: 25°C	30.8 V/ 90VAC 30.8 V/ 230VAC 30.8V/ 305VAC Shut down and latch off o/p voltage ,re-power on to removed
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 230VAC O/P: FULL LOAD	O.T.P. Active 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, recovers automatically after fault condition is removed

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q3 Rated 600V/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) 452 V (2) 452 V (3) 454 V
2	O/P Diode (MOSFET)	Q101 Rated 75V/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)58.4 V (2)15.8 V (3)54.8 V
3	Input Capacitor	C5 Rated 150u/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) 448 V (2) 440 V (3) 442 V
4	Control IC	U70 Rated 16V (MAX.)	I/P: High-Line +3V =308 V O/P: (1) FULL LOAD (2) NO LOAD input on /Off (3) FULL LOAD /NO LOAD Change Ta: 25°C	(1) 15.4 V (2) 15.4 V (3) 15.4 V
5	PFC Power Transistor	Q 1 Rated 600V/20.2A	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) 510 V (3) 498 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: 4.125KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG: 0.6 KVAC/min Ta: 25°C	I/P-O/P: 3.096 mA I/P-FG: 3.356 mA O/P-FG: 3.094 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 / 2min Ta: 25°C /70% RH	24 MΩ

E.M.C TEST

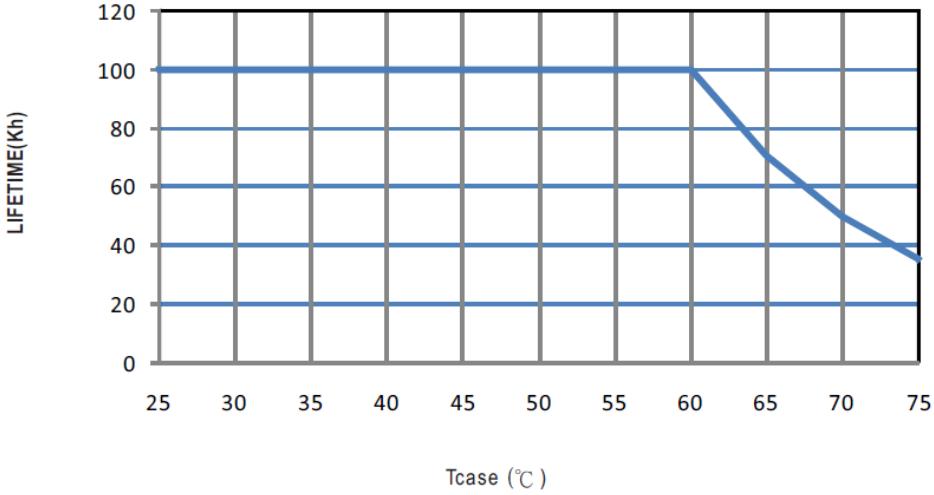
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 Class C	I/P: 230VAC/50HZ O/P: FULL/75% LOAD Ta: 25°C	PASS
2	CONDUCTION	EN55015	I/P: 230 VAC (50HZ) O/P: FULL LOAD Ta: 25°C	PASS Test by certified Lab
3	RADIATION	EN55015	I/P: 230 VAC (50HZ) O/P: FULL LOAD Ta: 25°C	PASS Test by certified 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	MODEL: HBG-240-24 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: 95% LOAD Ta=24.6 °C 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: 95% LOAD Ta=58.6 °C																																																																		
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta=24.6 °C</th> <th>HIGH AMBIENT Ta=58.6 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>RTH1</td><td>73.4°C</td><td>96.0°C</td></tr> <tr><td>2</td><td>BD1</td><td>57.3°C</td><td>86.5°C</td></tr> <tr><td>3</td><td>C5</td><td>55.5°C</td><td>84.1°C</td></tr> <tr><td>4</td><td>L1</td><td>54.6°C</td><td>83.4°C</td></tr> <tr><td>5</td><td>Q1</td><td>56.4°C</td><td>85.9°C</td></tr> <tr><td>6</td><td>D2</td><td>56.6°C</td><td>85.9°C</td></tr> <tr><td>7</td><td>U1</td><td>51.6°C</td><td>80.9°C</td></tr> <tr><td>8</td><td>C39</td><td>51.0°C</td><td>80.3°C</td></tr> <tr><td>9</td><td>Q3</td><td>57.2°C</td><td>86.6°C</td></tr> <tr><td>10</td><td>Q4</td><td>58.4°C</td><td>87.7°C</td></tr> <tr><td>11</td><td>T1</td><td>68.8°C</td><td>96.0°C</td></tr> <tr><td>12</td><td>Q101</td><td>62.4°C</td><td>93.5°C</td></tr> <tr><td>13</td><td>C103</td><td>56.7°C</td><td>86.9°C</td></tr> <tr><td>14</td><td>TSW1</td><td>53.8°C</td><td>82.9°C</td></tr> <tr><td>15</td><td>TC</td><td>44.5°C</td><td>74.2°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta=24.6 °C	HIGH AMBIENT Ta=58.6 °C	1	RTH1	73.4°C	96.0°C	2	BD1	57.3°C	86.5°C	3	C5	55.5°C	84.1°C	4	L1	54.6°C	83.4°C	5	Q1	56.4°C	85.9°C	6	D2	56.6°C	85.9°C	7	U1	51.6°C	80.9°C	8	C39	51.0°C	80.3°C	9	Q3	57.2°C	86.6°C	10	Q4	58.4°C	87.7°C	11	T1	68.8°C	96.0°C	12	Q101	62.4°C	93.5°C	13	C103	56.7°C	86.9°C	14	TSW1	53.8°C	82.9°C	15	TC	44.5°C	74.2°C
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15	TC	44.5°C	74.2°C																																																																	
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P: 305VAC/100VAC O/P: FULL LOAD Ta= -45°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	±0.004 %/°C (0~50°C)																																																																
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		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/95% 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: 180min in each axis (X.Y.Z) (6) Ta: 25°C	TEST: OK																								
8	CAPACITOR LIFE CYCLE	HBG-240-24: 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) 409516 HRS (2) 46167 HRS (3) 83344 HRS (4) 106254 HRS																								
9	MTBF	Conducted by Parts Stress Analysis Prediction 1792.9K hrs min. Telcordia SR-332 (Bellcore) ; 172.4K hrs min. MIL-HDBK-217F (25°C)																									
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50,000 hours @ Tcase 70°C  <table border="1" data-bbox="496 920 1433 1413"> <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>70</td></tr> <tr><td>70</td><td>45</td></tr> <tr><td>75</td><td>35</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	70	70	45	75	35
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TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	SHENJW/ZHUOKB	SKY	LIUWY