



# Test Report: PWM-120-12

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120W PWM Output 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

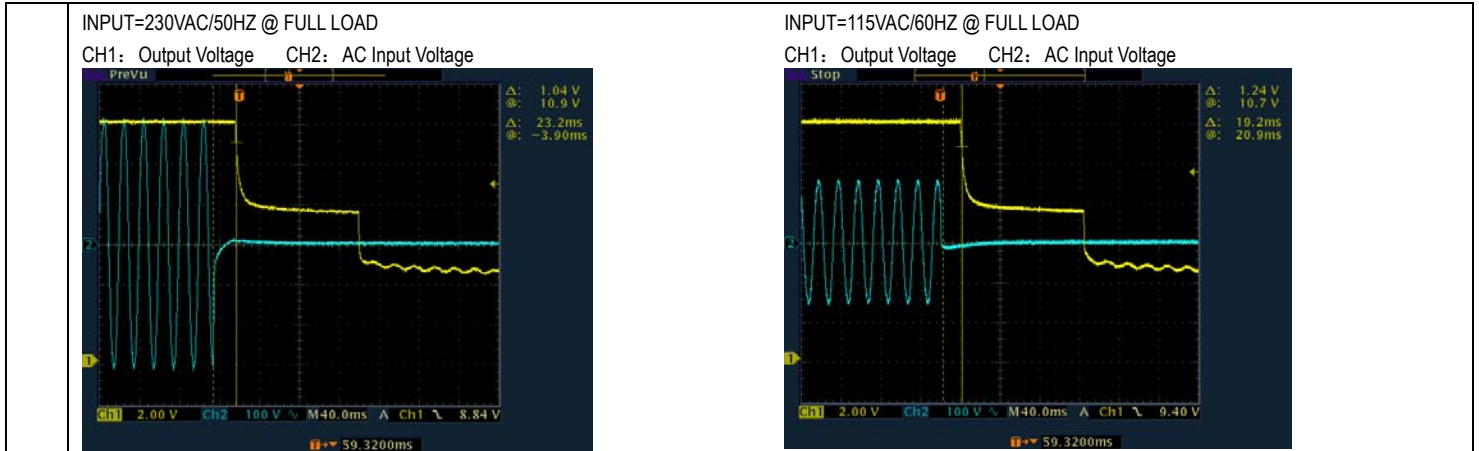
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM FREQUENCY	1.47KHz	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	1.479KHz
2	OVER/UNDERSHOOT TEST	<± 5 %	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	<5 %
3	SET UP TIME(Max)	230VAC/ 500ms 115VAC/ 500ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 372ms 115VAC/ 366ms
INPUT=230VAC/50HZ @ FULL LOAD CH1: Output Voltage CH2: AC Input Voltage				
INPUT=115VAC/60HZ @ FULL LOAD CH1: Output Voltage CH2: AC Input Voltage				
4	RISE TIME (Max)	230VAC/ 80ms 115VAC/ 80ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/0.081ms 115VAC/0.081ms
INPUT=230VAC/50HZ @ FULL LOAD CH1: Output Voltage				
INPUT=115VAC/60HZ @ FULL LOAD CH1: Output Voltage				
5	HOLD UP TIME(Typ)	230VAC/ 16ms 115VAC/ 16ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/23.2ms 115VAC/19.2ms



# 120W PWM Output LED Driver

# PWM-120 series



6 DIMMING TEST(for Blank-Type) ※ 3 in 1 dimming function (for Blank-Type)

- Apply one of the three methodologies between DIM+ and DIM-: 0 ~ 10VDC, or 10V PWM signal or resistance.
- Dimming source current from power supply: 100 $\mu$ A (typ.)

◎ Applying additive 0 ~ 10VDC

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

◎ Applying additive resistance:

Note : 1. Min. duty cycle of output current is about 0.15%, and the dimming input is about 6K $\Omega$  or 0.6VDC, or 10V PWM signal with 6% duty cycle.  
 2. The duty cycle of output current could drop down to 0% when dimming input is less than 6K $\Omega$  or less than 0.6VDC, or 10V PWM signal with duty cycle less than 6%.

I/P: 230 VAC; O/P: DIMMING TEST; Ta: 25 $^{\circ}$ C

	Resistance value	Dimming Input											
		Short	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN
1	Output Current	0	0.966	2.040	3.120	4.200	5.200	6.190	7.200	8.220	9.200	10.200	10.200
	Output Current duty	0%	9.66%	20.40%	31.20%	42.00%	52.00%	61.90%	72.00%	82.20%	92.00%	102.00%	102.00%
	Dimming value	0V	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
2	Output Current	0	0.987	2.000	2.960	3.990	5.030	6.040	7.110	8.190	9.220	10.200	10.200
	Output Current duty	0%	9.87%	20.00%	29.60%	39.90%	50.30%	60.40%	71.10%	81.90%	92.20%	102.00%	102.00%
	Duty value	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
3	Output Current	0	1.010	1.970	2.950	3.960	4.900	5.950	6.950	8.010	9.040	9.970	10.200
	Output Current duty	0%	10.10%	19.70%	29.50%	39.60%	49.00%	59.50%	69.50%	80.10%	90.40%	99.70%	102.00%



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7	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 6% 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	87V~305V
			I/P: (1)LOW-LINE-3V=87 V HIGH-LINE+10V=315 V O/P: FULL/NO LOAD ON: 30 Sec OFF: 30 Sec 10MIN (2)230VAC ON: 0.5 Sec OFF: 0.5 Sec 20MIN	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	1.3A/115VAC 0.65A/230VAC 0.55A/277VAC	I/P: 115 VAC I/P: 230 VAC I/P: 277 VAC O/P: FULL LOAD Ta: 25°C	I=1.127A/ 115VAC I=0.571A/ 230VAC I=0.490A/ 277VAC
4	LEAKAGE CURRENT	< 0.25mA / 277VAC	I/P: 277 VAC O/P: NO LOAD Ta: 25°C	L-FG: 0.003 mA N-FG: 0.003 mA
5	NO LOAD/STANDBY POWER CONSUMPTION	< 0.5W	I/P: 230VAC O/P: NO LOAD Ta: 25°C	0.173W
6	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: 7.64 % @ 60% load / 115VAC THD: 18.60 % @ 60% load / 230VAC THD: 17.99 % @ 75% load / 277VAC

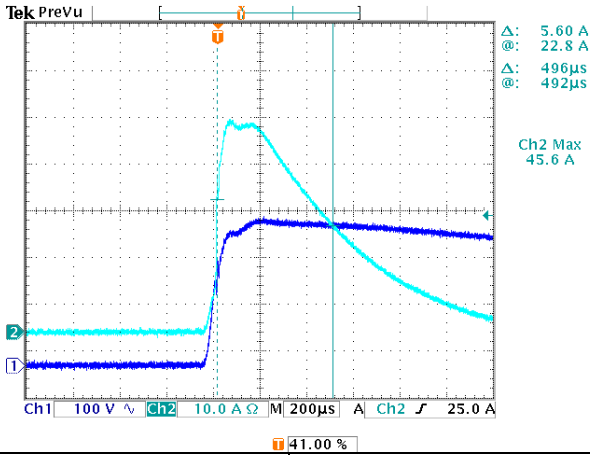


120W PWM Output LED Driver

PWM-120 series

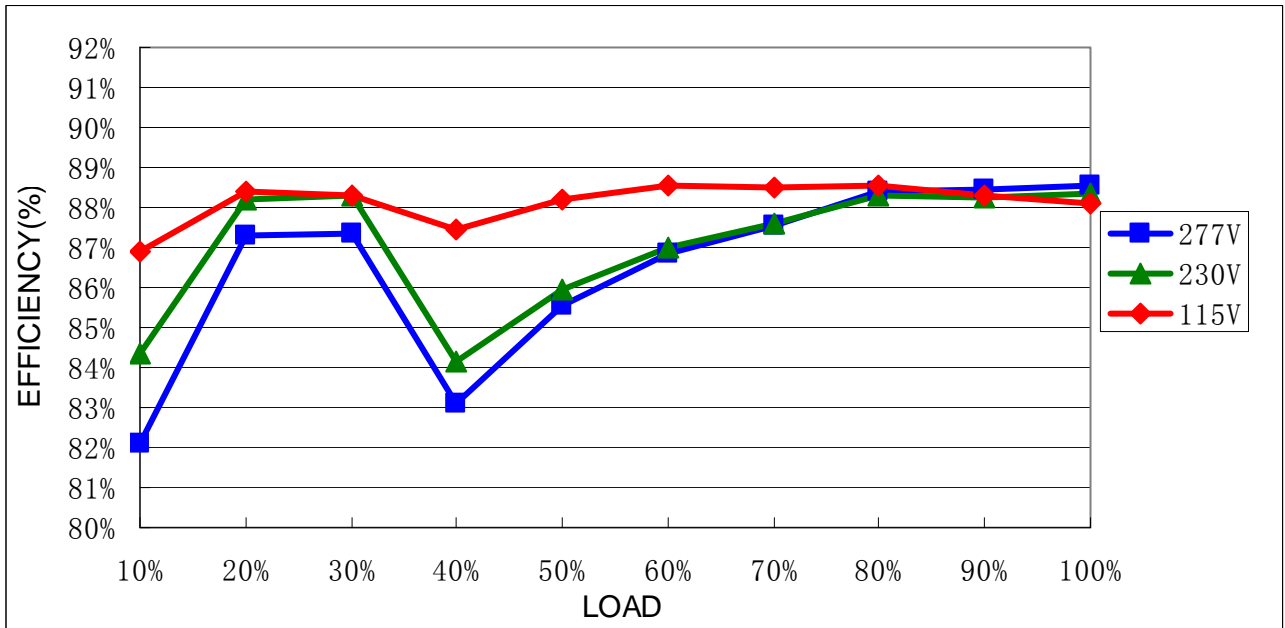
7	INRUSH CURRENT(Typ)	60A/230VAC Twidth =520 us measured at 50% Ipeak COLD START	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	I=45.6A/ 230VAC Twidth =496us
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INPUT=230VAC/50HZ @ FULL LOAD  
CH2: Input current CH1: AC Input Voltage



8	EFFICIENCY(Typ)	88%	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	88.35%
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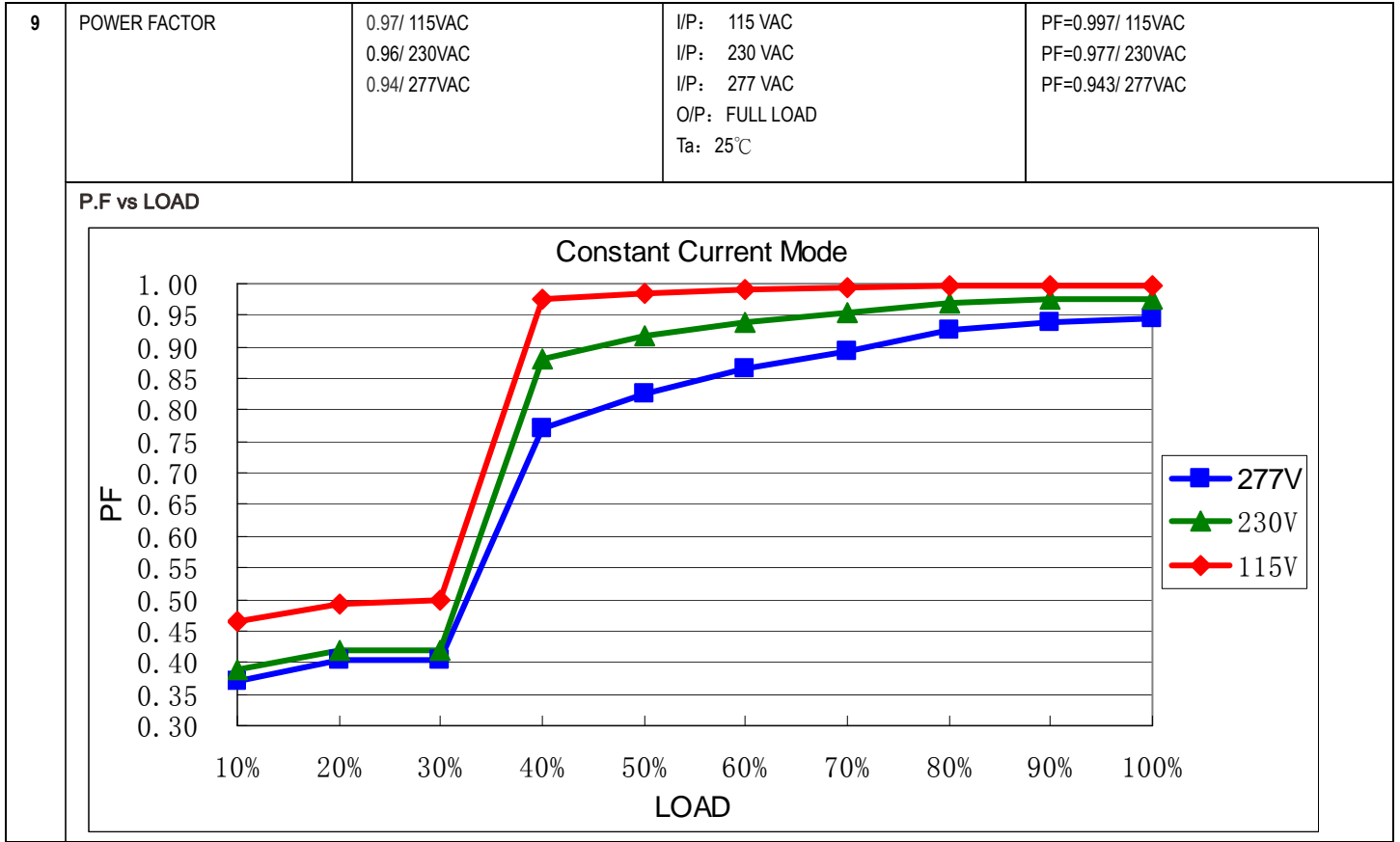
EFFICIENCY vs LOAD





120W PWM Output LED Driver

PWM-120 series



**PROTECTION FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	108 %~ 120 %	I/P: 230VAC O/P: TESTING Ta: 25°C	115.4%/ 230VAC Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	15V~17V	I/P: 230VAC O/P: NO LOAD Ta: 25°C	16.83V/ 230VAC Shut down o/p voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 230 VAC O/P: FULL LOAD	O.T.P. Active Shut down o/p voltage, re-power on to recover
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 295VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE Shut down o/p voltage, re-power on to recover



## COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q 2 Rated 730V/10A	I/P: High-Line +3V =308V O/P: (1) Full Load Turn on (2) Output Short (3) Full load continue Ta: 25°C	(1) 702V (2) 716V (3) 672V
2	Diode Peak Voltage	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) 71.2V (2) 73.8V (3) 70.0V
3	Input Capacitor Voltage	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) 446V (2) 440V (3) 448V
4	Control IC Voltage Test	U1 Rated 28V	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) 17.4V (2) 17.0V (3) 17.4V
5	PFC Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated 600V/15A	I/P: High-Line +3V =308V O/P: (1) Full Load Turn on (2) Output Short (3) Full load continue Ta: 25°C	(1) 482V (2) 454V (3) 478V





## SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3.75KVAC/min	I/P-O/P: 4.2KVAC/min Ta: 25°C	I/P-O/P: 1.724mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P: 500VDC>100MΩ	I/P-O/P: 500VDC Ta: 25°C	I/P-O/P: >9999MΩ

## E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS C	I/P: 230VAC/50HZ O/P: 60%/FULL 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: 230 VAC/50HZ O/P: FULL LOAD Ta: 25°C	PASS
6	SURGE	EN61000-4-5 INDUSTRY L-N: 2KV	I/P: 230 VAC/50HZ O/P: FULL LOAD Ta: 25°C	PASS
7	Test by certified Lab & Test Report Prepare			



RELIABILITY TEST

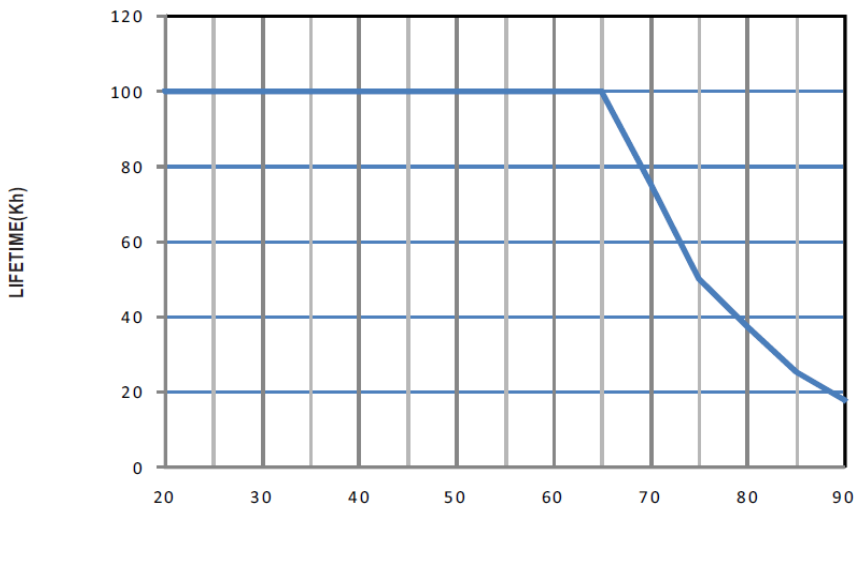
ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																				
1	TEMPERATURE RISE TEST	MODEL: PWM-120-12 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta= 30.5℃ 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta= 41.2℃																																																																																						
		<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 30.5 ℃</th> <th>HIGH AMBIENT Ta=41.2 ℃</th> </tr> </thead> <tbody> <tr><td>1</td><td>C110</td><td>71.5℃</td><td>84.1℃</td></tr> <tr><td>2</td><td>Q105</td><td>73.4℃</td><td>86.1℃</td></tr> <tr><td>3</td><td>C5</td><td>79.3℃</td><td>88.8℃</td></tr> <tr><td>4</td><td>C11</td><td>83.0℃</td><td>92.5℃</td></tr> <tr><td>5</td><td>C105</td><td>77.6℃</td><td>90.2℃</td></tr> <tr><td>6</td><td>T1</td><td>85.6℃</td><td>96.8℃</td></tr> <tr><td>7</td><td>RTH2</td><td>83.8℃</td><td>92.8℃</td></tr> <tr><td>8</td><td>Q1</td><td>86.6℃</td><td>96.6℃</td></tr> <tr><td>9</td><td>Q2</td><td>97.0℃</td><td>107.7℃</td></tr> <tr><td>10</td><td>Q101</td><td>75.1℃</td><td>88.7℃</td></tr> <tr><td>11</td><td>RTH1</td><td>63.8℃</td><td>70.7℃</td></tr> <tr><td>12</td><td>D10</td><td>101.5℃</td><td>113.4℃</td></tr> <tr><td>13</td><td>C45</td><td>75.9℃</td><td>85.7℃</td></tr> <tr><td>14</td><td>Q102</td><td>70.7℃</td><td>83.8℃</td></tr> <tr><td>15</td><td>U1</td><td>74.9℃</td><td>84.3℃</td></tr> <tr><td>16</td><td>R7</td><td>100.6℃</td><td>113.4℃</td></tr> <tr><td>17</td><td>C15</td><td>96.1℃</td><td>105.4℃</td></tr> <tr><td>18</td><td>C12</td><td>84.8℃</td><td>94.6℃</td></tr> <tr><td>19</td><td>RTH3</td><td>72.3℃</td><td>81.8℃</td></tr> <tr><td>20</td><td>TC</td><td>66.6℃</td><td>75.5℃</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 30.5 ℃	HIGH AMBIENT Ta=41.2 ℃	1	C110	71.5℃	84.1℃	2	Q105	73.4℃	86.1℃	3	C5	79.3℃	88.8℃	4	C11	83.0℃	92.5℃	5	C105	77.6℃	90.2℃	6	T1	85.6℃	96.8℃	7	RTH2	83.8℃	92.8℃	8	Q1	86.6℃	96.6℃	9	Q2	97.0℃	107.7℃	10	Q101	75.1℃	88.7℃	11	RTH1	63.8℃	70.7℃	12	D10	101.5℃	113.4℃	13	C45	75.9℃	85.7℃	14	Q102	70.7℃	83.8℃	15	U1	74.9℃	84.3℃	16	R7	100.6℃	113.4℃	17	C15	96.1℃	105.4℃	18	C12	84.8℃	94.6℃	19	RTH3	72.3℃	81.8℃	20	TC	66.6℃	75.5℃		
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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P: 305VAC/100VAC O/P: FULL LOAD Ta= -45℃ / -30℃	TEST: OK																																																																																				
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40 ℃ NO DAMAGE	I/P: 315VAC O/P: FULL LOAD Ta=40 ℃ HUMIDITY= 95% R.H	TEST: OK																																																																																				
4	TEMPERATURE COEFFICIENT	±0.03%/℃(0~50℃)	I/P: 230 VAC O/P: FULL LOAD	±0.004%/℃(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																																																																																				



120W PWM Output LED Driver

PWM-120 series

6	THERMAL SHOCK TEST	1. Thermal shock Temperature: -45°C~+45°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 turn on 58 sec, turn off 2 sec;	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	PWM-120-12: SUPPOSE C105 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= 40 °C LIFE TIME (3) I/P: 230VAC O/P: 75% LOAD Ta= 40 °C LIFE TIME (4) I/P: 230VAC O/P: 50% LOAD Ta= 40 °C LIFE TIME	(1) 102005 HRS (2) 31602 HRS (3) 55800 HRS (4) 110870 HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 860.4K hrs min. Telcordia SR-332 (Bellcore) 228.7K 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 	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	ZHANGZJ/ZHUOKB	SKY	LIUWY