Test Report：PWM-90-48

90W PWM Output LED Power Supply

■ 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	VERDICT
1	PWM FREQUENCY	1.47KHz	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	1.479KHz	PASS
2	OUTPUT VOLTAGE TOLERANCE	V1： -1 %~ 1 % (Max)	I/P：90 VAC / 305 VAC O/P：FULL/ NO LOAD Ta：25℃	V1： -0.18 %~ 0.06 %	PASS
3	SET UP TIME	230VAC： 500 ms (Max) 115VAC： 500 ms(Max)	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 405 ms 115VAC/ 447 ms	PASS
4	RISE TIME	230VAC： 80 ms (Max) 115VAC： 80 ms (Max)	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 0.172 ms 115VAC/ 0.172 ms	PASS
5	HOLD UP TIME	230VAC： 16 ms (TYP) 115VAC： 16 ms (TYP)	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 24.8 ms 277VAC/ 21.6 ms	PASS
6	OVER/UNDERSHOOT TEST	＜ ±5%	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	TEST： ＜ 5 %	PASS

7 DIMMER TEST

SPEC:
* The duty of the PWM style output can be adjusted through output cable by connecting a 0~10Vdc or 10V PWM signal or resistance between DIM+ and DIM－.

* Reference resistance value for output current adjustment (Typical)

Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K
Output duty	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

*0 ~ 10V dimming function for output current adjustment (Typical)

Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
Output duty	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

*10V PWM signal for output current adjustment (Typical)：Frequency range：100Hz~3KHz

Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Output duty	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

TEST RESULT: I/P： 230 VAC ;Ta：25℃

1	Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K
	Output Current	0.197A	0.384A	0.568A	0.768A	0.954A	1.141A	1.320A	1.513A	1.697A	1.877A
	%	10.48%	20.43%	30.21%	40.85%	50.74%	60.69%	70.21%	80.48%	90.27%	99.84%
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
	Output Current	0.198A	0.373A	0.553A	0.742A	0.933A	1.125A	1.321A	1.518A	1.717A	1.878A
	%	10.53%	19.84%	29.41%	39.47%	49.63%	59.84%	70.27%	80.74%	91.33%	99.89%
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Output Current	0.192A	0.365A	0.546A	0.736A	0.928A	1.129A	1.316A	1.511A	1.719A	1.875A
	%	10.21%	19.41%	29.04%	39.15%	49.36%	60.05%	70.00%	80.37%	91.44%	99.73%

PASS

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	90 VAC~305 VAC	I/P：TESTING O/P：FULL LOAD Ta：25℃	87 V~305 V	PASS
			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 (3)230VAC ON：3Sec OFF：3Sec 12HOURS (POWER ON/OFF NO DAMAGE)	TEST： (1) OK (2) OK (3) OK	
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE OSC	I/P： 90 VAC ~ 305 VAC O/P：FULL ~NO LOAD Ta：25℃	TEST： OK	PASS
3	POWER FACTOR	115V/ 0.98 (TYP) 230V/ 0.96 (TYP) 277V/ 0.94 (TYP)	I/P： 115 VAC I/P： 230 VAC I/P： 277 VAC O/P：FULL LOAD Ta：25℃	PF= 0.997 / 115 VAC PF= 0.974 / 230 VAC PF= 0.950 / 277 VAC	PASS
4	EFFICIENCY	90.5% (TYP)	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	91.12%	PASS
5	INPUT CURRENT	115V/ 0.95 A (TYP) 230V/ 0.5 A (TYP) 277V/ 0.4 A (TYP)	I/P： 115 VAC I/P： 230 VAC I/P： 277 VAC O/P：FULL LOAD Ta：25℃	I = 0.869 A/ 115 VAC I = 0.439 A/ 230 VAC I = 0.374 A/ 277 VAC	PASS
6	INRUSH CURRENT	230V/ 60 A (TYP) Twidth =550 us measured at 50% Ipeak COLD START	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I = 51.0 A Twidth = 388 us	PASS
7	LEAKAGE CURRENT	< 0.25 mA / 277 VAC	I/P： 305 VAC O/P：NO LOAD Ta：25℃	L-CASE： 0.003 mA N-CASE： 0.003 mA	PASS
8	NO LOAD CONSUMPTION	< 0.5 W	I/P：230VAC O/P：NO LOAD Ta：25℃	< 0.395 W	PASS
9	TOTAL HARMONIC DISTORTION	Total harmonic distortion will be lower than 20% when output loading is 60% or higher at 230V/115VAC Total harmonic distortion will be lower than 20% when output loading is 75% or higher at 277VAC	I/P： 115 VAC I/P： 230 VAC O/P：60% LOAD I/P： 277 VAC O/P：75%LOAD Ta：25℃	THD： 5.37% /115VAC THD： 15.69% /230VAC THD： 15.55% /277VAC	PASS

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	108 % ~ 120 %	I/P： 100 VAC I/P： 230 VAC I/P： 305 VAC O/P：TESTING Ta：25℃	114.32 %/ 100 VAC 114.30 %/ 230 VAC 114.31 %/ 305 VAC Hiccup mode , recovers automatically after fault condition is removed	PASS
2	OVER VOLTAGE PROTECTION	CH1： 54 V ~ 60 V	I/P： 90 VAC I/P： 230 VAC I/P： 305 VAC O/P：NO LOAD Ta：25℃	57.38 V/ 90 VAC 56.36 V/ 230 VAC 56.38 V/ 305 VAC Shut down o/p voltage， re-power on to recover	PASS
3	OVER TEMPERATURE PROTECTION	SPEC： O.T.P. NO DAMAGE	I/P： 230 VAC O/P：FULL LOAD	O.T.P. Active Shut down o/p voltage，re-power on to recover	PASS
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P： 305 VAC O/P：FULL LOAD Ta：25℃	NO DAMAGE Hiccup mode , recovers automatically after fault condition is removed	PASS

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q2 Rated 800 V 9A	I/P：High-Line +3V = 308 V O/P： (1) FULL LOAD Turn on (2) Output Short (3) FULL LOAD continue Ta：25℃	(1) 728 V (2) 704 V (3) 712 V	PASS
2	Diode Peak Voltage	Q101 Rated 170V 20 A Q105 Rated 60V 79A	I/P：High-Line +3V = 308 V O/P： (1) FULL LOAD Turn on (2) Output Short (3) FULL LOAD continue Ta：25℃	Q101 (1) 154 V (2) 155 V (3) 154 V Q105 (1) 48.0 V (2) 49.8 V (3) 0 V	PASS
3	Input Capacitor Voltage	C5 Rated: 82uF / 450 V	I/P：High-Line +3V = 308 V O/P: (1) FULL LOAD input on/off (2) NO LOAD Turn on /Off (3) FULL LOAD / NO LOAD Change Ta：25℃	(1) 440 V (2) 440 V (3) 446 V	PASS
4	Control IC Voltage Test	U1 Rated 28 V	I/P：High-Line +3V = 298 V O/P： (1) FULL LOAD Turn on /Off (2) NO LOAD Turn on /Off (3) FULL LOAD / NO LOAD Change Ta：25℃	(1) 17.4 V (2) 17.4 V (3) 17.4 V	PASS
5	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated 600 V/ 10 A	I/P：High-Line +3V = 308 V O/P： (1) FULL LOAD Turn on (2) Output Short (3) FULL LOAD continue Ta：25℃	(1) 476 V (2) 460 V (3) 460 V	PASS

■ SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P： 3.75 KVAC/min	I/P-O/P： 4.2 KVAC/min Ta：25℃	I/P-O/P： 2.684 mA NO DAMAGE	PASS
2	ISOLATION RESISTANCE	I/P-O/P：500VDC>100MΩ	I/P-O/P： 500 VDC Ta：25℃/70%RH	I/P-O/P： >9999 MΩ NO DAMAGE	PASS

E.M.C TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS C	I/P：115VAC/230VAC/50HZ O/P：60%/FULL LOAD I/P：277VAC/50HZ O/P：75%/FULL LOAD Ta:25℃	OK	PASS
2	CONDUCTION	EN55015	I/P：230 VAC/50HZ O/P:FULL LOAD Ta:25℃	OK Test by certified Lab	PASS
3	RADIATION	EN55015	I/P：230 VAC/50HZ O/P:FULL LOAD Ta:25℃	OK Test by certified Lab	PASS
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV	I/P：230 VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A	PASS
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT：1KV	I/P：230 VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A	PASS
6	SURGE	IEC61000-4-5 INDUSTRY L-N :2KV	I/P：230 VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A	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><th>VERDICT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL： PWM-90-36
1. ROOM AMBIENT BURN-IN：2 HRS
I/P： 230VAC O/P： FULL LOAD Ta=28.8 ℃
2. HIGH AMBIENT BURN-IN： 2 HRS
I/P： 230VAC O/P： FULL LOAD Ta=46.0 ℃
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT
Ta= 30.3 ℃</th><th>HIGH AMBIENT
Ta= 52.0 ℃</th></tr>
<tr><td>1</td><td>C5</td><td>64.0℃</td><td>78.4℃</td></tr>
<tr><td>2</td><td>C105</td><td>65.9℃</td><td>79.4℃</td></tr>
<tr><td>3</td><td>T1</td><td>70.9℃</td><td>85.0℃</td></tr>
<tr><td>4</td><td>Q1</td><td>69.6℃</td><td>86.0℃</td></tr>
<tr><td>5</td><td>Q2</td><td>70.8℃</td><td>87.0℃</td></tr>
<tr><td>6</td><td>Q101</td><td>69.3℃</td><td>82.7℃</td></tr>
<tr><td>7</td><td>D6</td><td>66.8℃</td><td>81.8℃</td></tr>
<tr><td>8</td><td>C110</td><td>60.2℃</td><td>73.6℃</td></tr>
<tr><td>9</td><td>C205</td><td>63.9℃</td><td>77.2℃</td></tr>
<tr><td>10</td><td>C41</td><td>63.6℃</td><td>77.5℃</td></tr>
<tr><td>11</td><td>ZNR2</td><td>64.9℃</td><td>80.4℃</td></tr>
<tr><td>12</td><td>D5</td><td>63.1℃</td><td>78.4℃</td></tr>
<tr><td>13</td><td>U1</td><td>64.5℃</td><td>79.2℃</td></tr>
<tr><td>14</td><td>D10</td><td>77.5℃</td><td>93.0℃</td></tr>
<tr><td>15</td><td>TC</td><td>60.3℃</td><td>75.0℃</td></tr>
</table></td><td>PASS</td></tr>
<tr><td>2</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P：305VAC/100VAC
O/P：FULL LOAD
Ta= -45℃/-30℃</td><td>TEST：OK</td><td>PASS</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 50 ℃
NO DAMAGE</td><td>I/P：315 VAC
O/P：FULL LOAD
Ta= 50 ℃
HUMIDITY= 95% R.H</td><td>TEST：OK</td><td>PASS</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>±0.002 %(0~50℃)</td><td>PASS</td></tr>
<tr><td>5</td><td>STORAGE TEMPERATURE TEST</td><td colspan="2">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</td><td>OK</td><td>PASS</td></tr>
<tr><td>6</td><td>THERMAL SHOCK TEST</td><td colspan="2">1. Thermal shock Temperature： -45℃~ +55℃
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
turn on 58sec；turn off 2sec</td><td>OK</td><td>PASS</td></tr>
</table>

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：90min in each axis (X.Y.Z) (6) Ta：25℃	TEST：OK	PASS
8	CAPACITOR LIFE CYCLE	PWM-90-36：SUPPOSE C105 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=50℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta=50℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta=50℃ LIFE TIME	(1) 162934 HRS (2) 37235 HRS (3) 65723 HRS (4) 72887 HRS	PASS
9	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE：224.2KHRS		PASS
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) ： 50000 hours @ Tcase 75℃		PASS

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	ZHANGZJ/ZHUOKB	SKY	LIUWY

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