



# Test Report : PWM-90-36

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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°C	1.479KHz	PASS
2	OUTPUT VOLTAGE TOLERANCE	V1 : -2%~ 2% (Max)	I/P : 90 VAC / 305 VAC O/P : FULL/ NO LOAD Ta : 25°C	V1 : 0 %~ 0.26 %	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°C	230VAC/ 396 ms 115VAC/ 386 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°C	230VAC/ 0.080 ms 115VAC/ 0.081 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°C	230VAC/ 21.6 ms 277VAC/ 18.4 ms	PASS
6	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	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°C												
1	Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	
	Output Current	0.254A	0.497A	0.733A	0.979A	1.260A	1.531A	1.804A	2.073A	2.342A	2.517A	
	%	10.16%	19.88%	29.32%	39.16%	50.40%	61.24%	72.16%	82.92%	93.68%	100.68%	
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	
	Output Current	0.258A	0.480A	0.693A	0.922A	1.190A	1.463A	1.724A	1.997A	2.266A	2.523A	
	%	10.32%	19.20%	27.72%	36.88%	47.60%	58.52%	68.96%	79.88%	90.64%	100.92%	
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	
	Output Current	0.238A	0.445A	0.662A	0.895A	1.154A	1.403A	1.666A	1.938A	2.184A	2.411A	
	%	9.52%	17.80%	26.48%	35.80%	46.16%	56.12%	66.64%	77.52%	87.36%	96.44%	
<b>PASS</b>												

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°C	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°C	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°C	PF= 0.993 / 115 VAC PF= 0.962 / 230 VAC PF= 0.945 / 277 VAC	PASS
4	EFFICIENCY	90.5% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	92.37%	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°C	I = 0.876 A/ 115 VAC I = 0.441 A/ 230 VAC I = 0.375 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°C	I = 50.8 A Twidth = 396 us	PASS
7	LEAKAGE CURRENT	< 0.25 mA/ 277 VAC	I/P : 305 VAC O/P : NO LOAD Ta : 25°C	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°C	< 0.341 W	PASS
9	TOTAL HARMONIC DISTORTION	Total harmonic distortion will be lower than 20% when output loading is 60% or higher at 115V/230VAC 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°C	THD : 5.25% /115VAC THD : 13.75% /230VAC THD : 14.54% /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°C	113.92 %/ 100 VAC 113.70 %/ 230 VAC 114.00 %/ 305 VAC Hiccup mode , recovers automatically after fault condition is removed	PASS
2	OVER VOLTAGE PROTECTION	CH1 : 41 V ~ 46 V	I/P : 90 VAC I/P : 230 VAC I/P : 305 VAC O/P : NO LOAD Ta : 25°C	44.24 V/ 90 VAC 44.24 V/ 230 VAC 44.24 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°C	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°C	(1) 752 V (2) 732 V (3) 716 V	PASS
2	Diode Peak Voltage	Q101 Rated 150 V 30 A  Q105 Rated 60 V 79A	I/P : High-Line +3V = 308 V O/P : (1) FULL LOAD Turn on (2) Output Short (3) FULL LOAD continue Ta : 25°C	Q101 (1) 113 V (2) 114 V (3) 112 V  Q105 (1) 19.3 V (2) 38.8 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°C	(1) 446 V (2) 436 V (3) 438 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°C	(1) 17.2 V (2) 17.1 V (3) 17.1 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°C	(1) 482 V (2) 466 V (3) 466 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°C	I/P-O/P : 2.733 mA NO DAMAGE	PASS
2	ISOLATION RESISTANCE	I/P-O/P : 500VDC>100MΩ	I/P-O/P : 500 VDC Ta : 25°C/70%RH	I/P-O/P : >9999 MΩ NO DAMAGE	PASS

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	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°C	OK	PASS
2	CONDUCTION	EN55015	I/P : 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	OK Test by certified Lab	PASS
3	RADIATION	EN55015	I/P : 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	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°C	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°C	CRITERIA A	PASS
6	SURGE	IEC61000-4-5 INDUSTRY L-N :2KV	I/P : 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A	PASS
7	Test by certified Lab & Test Report Prepare				

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT																																																																
1	TEMPERATURE RISE TEST	MODEL : PWM-90-36 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=28.8 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=46.0 °C <table border="1" data-bbox="470 584 1145 1086"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 28.8 °C</th> <th>HIGH AMBIENT Ta= 46.0 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>C5</td><td>64.0°C</td><td>78.4°C</td></tr> <tr><td>2</td><td>C105</td><td>65.9°C</td><td>79.4°C</td></tr> <tr><td>3</td><td>T1</td><td>70.9°C</td><td>85.0°C</td></tr> <tr><td>4</td><td>Q1</td><td>69.6°C</td><td>86.0°C</td></tr> <tr><td>5</td><td>Q2</td><td>70.8°C</td><td>87.0°C</td></tr> <tr><td>6</td><td>Q101</td><td>69.3°C</td><td>82.7°C</td></tr> <tr><td>7</td><td>D6</td><td>66.8°C</td><td>81.8°C</td></tr> <tr><td>8</td><td>C110</td><td>60.2°C</td><td>73.6°C</td></tr> <tr><td>9</td><td>C205</td><td>63.9°C</td><td>77.2°C</td></tr> <tr><td>10</td><td>C41</td><td>63.6°C</td><td>77.5°C</td></tr> <tr><td>11</td><td>ZNR2</td><td>64.9°C</td><td>80.4°C</td></tr> <tr><td>12</td><td>D5</td><td>63.1°C</td><td>78.4°C</td></tr> <tr><td>13</td><td>U1</td><td>64.5°C</td><td>79.2°C</td></tr> <tr><td>14</td><td>D10</td><td>77.5°C</td><td>93.0°C</td></tr> <tr><td>15</td><td>TC</td><td>60.3°C</td><td>75.0°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 28.8 °C	HIGH AMBIENT Ta= 46.0 °C	1	C5	64.0°C	78.4°C	2	C105	65.9°C	79.4°C	3	T1	70.9°C	85.0°C	4	Q1	69.6°C	86.0°C	5	Q2	70.8°C	87.0°C	6	Q101	69.3°C	82.7°C	7	D6	66.8°C	81.8°C	8	C110	60.2°C	73.6°C	9	C205	63.9°C	77.2°C	10	C41	63.6°C	77.5°C	11	ZNR2	64.9°C	80.4°C	12	D5	63.1°C	78.4°C	13	U1	64.5°C	79.2°C	14	D10	77.5°C	93.0°C	15	TC	60.3°C	75.0°C			PASS
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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°C/-30°C	TEST : OK	PASS																																																																
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE	I/P : 315 VAC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95% R.H	TEST : OK	PASS																																																																
4	TEMPERATURE COEFFICIENT	±0.03 %(0~50°C)	I/P : 230 VAC O/P : FULL LOAD	±0.006 %(0~50°C)	PASS																																																																
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		OK	PASS																																																																
6	THERMAL SHOCK TEST	1. Thermal shock Temperature : -45°C ~ +55°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 58sec ; turn off 2sec		OK	PASS																																																																

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°C	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 °C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta=50 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta=50 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta=50 °C 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°C		PASS

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	ZHANGZJ/ZHUOKB	SKY	LIUWY

2009/08/04 A50-G058