



# Test Report : PWM-40-36

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40W 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(Typ)	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	1.483KHz	PASS
2	OUTPUT VOLTAGE TOLERANCE	V1: -2.0%~+2.0% (Max)	I/P: 90 VAC / 305VAC O/P:FULL/ NO LOAD Ta:25°C	V1: -0.042% ~ 0.069%	PASS
3	SET UP TIME	230VAC : 500 ms (Max) 115VAC : 500 ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:95% LOAD Ta:25°C	230VAC/ 313 ms 115VAC/ 325 ms	PASS
4	RISE TIME	230VAC : 80 ms (Max) 115VAC : 80 ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:95% LOAD Ta:25°C	230VAC/ 0.14 ms 115VAC/ 0.17 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 ms 115VAC/ 19 ms	PASS
6	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	TEST: <5 %	PASS

7	DIMMER TEST	<p>SPEC:</p> <p>*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 - .</p> <p>* Reference resistance value for output current adjustment (Typical)</p> <table border="1"> <tr> <th>Resistance value</th> <td>10K</td><td>20K</td><td>30K</td><td>40K</td><td>50K</td><td>60K</td><td>70K</td><td>80K</td><td>90K</td><td>100K</td> </tr> <tr> <th>Output duty</th> <td>10%</td><td>20%</td><td>30%</td><td>40%</td><td>50%</td><td>60%</td><td>70%</td><td>80%</td><td>90%</td><td>100%</td> </tr> </table> <p>*0 ~ 10V dimming function for output current adjustment (Typical)</p> <table border="1"> <tr> <th>Dimming value</th> <td>1V</td><td>2V</td><td>3V</td><td>4V</td><td>5V</td><td>6V</td><td>7V</td><td>8V</td><td>9V</td><td>10V</td> </tr> <tr> <th>Output duty</th> <td>10%</td><td>20%</td><td>30%</td><td>40%</td><td>50%</td><td>60%</td><td>70%</td><td>80%</td><td>90%</td><td>100%</td> </tr> </table> <p>*10V PWM signal for output current adjustment (Typical): Frequency range: 100Hz~3KHz</p> <table border="1"> <tr> <th>Duty value</th> <td>10%</td><td>20%</td><td>30%</td><td>40%</td><td>50%</td><td>60%</td><td>70%</td><td>80%</td><td>90%</td><td>100%</td> </tr> <tr> <th>Output duty</th> <td>10%</td><td>20%</td><td>30%</td><td>40%</td><td>50%</td><td>60%</td><td>70%</td><td>80%</td><td>90%</td><td>100%</td> </tr> </table>										Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	Output duty	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	Output duty	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Output duty	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
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		TEST RESULT: I/P : 230 VAC ;Ta : 25°C																																																																											
		1	Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K																																																																
			Output Current	0.121A	0.232A	0.342A	0.456A	0.565A	0.672A	0.774A	0.879A	0.974A	1.074A																																																																
%	10.80%		20.71%	30.54%	40.71%	50.45%	60.00%	69.11%	78.48%	86.96%	95.89%																																																																		
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V																																																																		
	Output Current	0.117A	0.227A	0.330A	0.453A	0.566A	0.686A	0.806A	0.928A	1.043A	1.156A																																																																		
	%	10.45%	20.27%	29.46%	40.45%	50.54%	61.25%	71.96%	82.86%	93.13%	103.21%																																																																		
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%																																																																		
	Output Current	0.117A	0.221A	0.335A	0.452A	0.571A	0.684A	0.804A	0.931A	1.048A	1.155A																																																																		
	%	10.45%	19.73%	29.91%	40.36%	50.98%	61.07%	71.79%	83.13%	93.57%	103.13%																																																																		

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°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/ 0.97 (TYP) 230V/ 0.95 (TYP) 277V/ 0.92 (TYP)	I/P : 115 VAC I/P : 230 VAC I/P : 277 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.996 / 115 VAC PF= 0.977 / 230 VAC PF= 0.944 / 277 VAC	PASS
4	EFFICIENCY	90% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	90.16%	PASS
5	INPUT CURRENT	115V/ 0.6 A (TYP) 230V/ 0.3 A (TYP) 277V/ 0.25 A (TYP)	I/P : 115 VAC I/P : 230 VAC I/P : 277 VAC O/P : FULL LOAD Ta : 25°C	I = 0.393 A / 115 VAC I = 0.200 A / 230 VAC I = 0.172 A / 277 VAC	PASS
6	INRUSH CURRENT	230V/ 50 A (TYP) Twidth =270 us measured at 50% Ipeak COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 37.7 A Twidth = 250 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	0.36 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°C	THD : 7.15% /115VAC THD : 15.79% /230VAC THD : 16.41% /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	113.0 %/ 100 VAC 113.2 %/ 230 VAC 113.2 %/ 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	43.64 V/ 90 VAC 43.60 V/ 230 VAC 43.60 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 9 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) 612 V (2) 610 V (3) 610 V	PASS
2	Diode Peak Voltage	D100 Rated 170 V 20 A  Q105 60 V 79 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	D100 (1) 151 V (2) 152 V (3) 154 V Q105 (1) 48.2 V (2) 51.2 V (3) 0 V	PASS
3	Input Capacitor Voltage	C5 Rated 33uF / 450 V	I/P : High-Line +3V = 308 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) 446 V (2) 446 V (3) 442 V	PASS
4	Control IC Voltage Test	U1 Rated 28V	I/P : High-Line +3V = 308 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) 17.3 V (2) 17.3 V (3) 17.3 V	PASS
5	PFC 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) 448 V (2) 440 V (3) 458 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 : 2.790 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 CLASS B	I/P : 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	OK Test by certified Lab	PASS
3	RADIATION	EN55015 CLASS B	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-40-36 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=23.3 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=51.3 °C			PASS																																																																
		<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 23.3 °C</th> <th>HIGH AMBIENT Ta= 51.3 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>C11</td><td>43.5°C</td><td>72.7°C</td></tr> <tr><td>2</td><td>D6</td><td>43.7°C</td><td>73.0°C</td></tr> <tr><td>3</td><td>Q1</td><td>45.9°C</td><td>75.0°C</td></tr> <tr><td>4</td><td>Q2</td><td>47.5°C</td><td>76.6°C</td></tr> <tr><td>5</td><td>C5</td><td>41.8°C</td><td>70.5°C</td></tr> <tr><td>6</td><td>T1</td><td>47.5°C</td><td>75.9°C</td></tr> <tr><td>7</td><td>C45</td><td>42.3°C</td><td>70.9°C</td></tr> <tr><td>8</td><td>U1</td><td>42.9°C</td><td>72.0°C</td></tr> <tr><td>9</td><td>C105</td><td>41.1°C</td><td>69.9°C</td></tr> <tr><td>10</td><td>D100</td><td>41.7°C</td><td>70.5°C</td></tr> <tr><td>11</td><td>Q105</td><td>39.4°C</td><td>68.1°C</td></tr> <tr><td>12</td><td>U100</td><td>38.5°C</td><td>67.4°C</td></tr> <tr><td>13</td><td>C112</td><td>36.1°C</td><td>65.0°C</td></tr> <tr><td>14</td><td>RTH2</td><td>41.2°C</td><td>69.7°C</td></tr> <tr><td>15</td><td>TC</td><td>39.3°C</td><td>67.9°C</td></tr> </tbody> </table>	NO	Position		ROOM AMBIENT Ta= 23.3 °C	HIGH AMBIENT Ta= 51.3 °C	1	C11	43.5°C	72.7°C	2	D6	43.7°C	73.0°C	3	Q1	45.9°C	75.0°C	4	Q2	47.5°C	76.6°C	5	C5	41.8°C	70.5°C	6	T1	47.5°C	75.9°C	7	C45	42.3°C	70.9°C	8	U1	42.9°C	72.0°C	9	C105	41.1°C	69.9°C	10	D100	41.7°C	70.5°C	11	Q105	39.4°C	68.1°C	12	U100	38.5°C	67.4°C	13	C112	36.1°C	65.0°C	14	RTH2	41.2°C	69.7°C	15	TC	39.3°C	67.9°C		
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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	±0.008 %(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-40-36 : 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) 914605 HRS (2) 153006 HRS (3) 169694 HRS (4) 220860 HRS	PASS
9	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 270.02 KHRS		PASS
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50000 hours @ Tcase 70°C		PASS

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	ZHANGZJ/ Cary Chen	SKY	LIUWY

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