Test Report: LPF-60D-20

60W Single Output Switching 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	RIPPLE & NOISE	V1：150 mVp-p (Max)	I/P： 230VAC O/P：FULL LOAD Ta：25℃	V1： 21.6 mVp-p (Max)	P
2	CONSTANT CURRENT REGION	V1= 12V~20V	I/P： 230VAC O/P：CV MODE Ta：25℃	O/P= 12V： 3.16 A O/P= 19V： 3.16 A	P
3	OUTPUT VOLTAGE TOLERANCE	V1： 4 %~ -4 % (Max)	I/P：100 VAC / 305 VAC O/P：FULL/ MIN LOAD Ta：25℃	V1： 0.3 %~ -0.3 %	P
4	LINE REGULATION	V1： 0.5 %~ -0.5 % (Max)	I/P：100 VAC ~ 305 VAC O/P：FULL LOAD Ta：25℃	V1： 0 %~ 0 %	P
5	LOAD REGULATION	V1：1 %~ -1 % (Max)	I/P： 230 VAC O/P：FULL ~MIN LOAD Ta：25℃	V1： 0.3 %~ -0.3 %	P
6	SET UP TIME	230VAC： 500 ms (Max) 115VAC： 1000 ms(Max)	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 274 ms 115VAC/ 350 ms	P
7	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/ 12 ms 115VAC/ 13 ms	P
8	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/ 61 ms 115VAC/ 32 ms	P
9	OVER/UNDERSHOOT TEST	< ±5%	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	TEST： <5 %	P
10	DYNAMIC LOAD	V1： 2000 mVp-p	I/P： 230 VAC (1).O/P：FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P：FULL /Min LOAD 50%DUTY/ 120HZ Ta：25℃	(1)373 mVp-p (2)319 mVp-p	P

11	DIMMER TEST	SPEC: *Output constant current level can be adjusted through output cable by 1 ~ 10Vdc, PWM signal or resistor between ADJ1(+) and ADJ2(-). *Reference resistance value for output current adjustment (Typical)	P

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

*1 ~ 10V dimming function for output current adjustment (Typical)

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

*10V PWM signal for output current adjustment (Typical)

Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Output current	**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	0.353A	0.625A	0.926A	1.217A	1.506A	1.797A	2.078A	2.367A	2.688A	2.974A
	%	**11.77%**	**20.83%**	**30.87%**	**40.57%**	**50.20%**	**59.90%**	**69.27%**	**78.90%**	**89.60%**	**99.13%**
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
	Output current	0.362A	0.658A	0.951A	1.240A	1.537A	1.828A	2.123A	2.418A	2.703A	3.001A
	%	**12.07%**	**21.93%**	**31.70%**	**41.33%**	**51.23%**	**60.93%**	**70.77%**	**80.60%**	**90.10%**	**100.03%**
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Output current	0.293A	0.597A	0.902A	1.206A	1.511A	1.816A	2.121A	2.427A	2.734A	3.023A
	%	**9.77%**	**19.90%**	**30.07%**	**40.20%**	**50.37%**	**60.53%**	**70.70%**	**80.90%**	**91.13%**	**100.77%**

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	100VAC~305 VAC	I/P：TESTING O/P：FULL LOAD Ta：25℃	76 V~305V	P
			I/P： LOW-LINE-3V=97 V HIGH-LINE+15%=300 V O/P：FULL/MIN LOAD ON： 30 Sec . OFF： 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE)	TEST： OK	
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE OSC	I/P： 100 VAC ~ 305 VAC O/P：FULL~MIN LOAD Ta：25℃	TEST： OK	P

3	POWER FACTOR	0.95 / 230 VAC(TYP) 0.98 / 115 VAC(TYP) 0.92 / 277 VAC(TYP)	I/P： 230 VAC I/P： 115 VAC I/P： 277 VAC O/P：FULL LOAD Ta：25℃	PF= 0.980 / 100% PF= 0.998 / 100% PF= 0.93 / 100%	P
4	EFFICIENCY	88% (TYP)	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	90.38 %	P
5	INPUT CURRENT	230V/ 0.4 A (TYP) 115V/ 0.8 A (TYP)	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I = 0.29 A/ 230 VAC I = 0.58 A/ 115 VAC	P
6	INRUSH CURRENT	230V/ 55 A (TYP) COLD START	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I = 45 A/ 230 VAC	P
7	LEAKAGE CURRENT	< 0.75 mA / 240 VAC	I/P： 277 VAC O/P：Min LOAD Ta：25℃	L-CASE： 0.01 mA N-CASE： 0.01 mA	P

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	95 % ~ 108 %	I/P： 230 VAC I/P： 115 VAC O/P：TESTING Ta：25℃	105 %/ 230 VAC 105 %/ 115 VAC Constant Current Limiting ,recovers automatically after fault condition is removed.	P
2	OVER VOLTAGE PROTECTION	CH1： 23 V ~ 27 V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	25.31 V/ 230 VAC 25.43 V/ 115 VAC Shut down and latch off o/p voltage, re-power on to recover	P
3	OVER TEMPERATURE PROTECTION	SPEC： RTH2： 90± 10℃ 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	P
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.	P

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q 3 Rated： 2SK3673-01MR 10A/700V	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta：25℃	(1) 632 V (2) 516 V (3) 628 V	P
2	Diode Peak Voltage	D101 Rated： STPS30M100ST 30A/100V	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2)Output Short (3)Fulll load continue Ta：25℃	(1) 96 V (2) 93.2 V (3) 93 V	P
4	Input Capacitor Voltage	C5 Rated： 47u/450V 105℃ 16*25 KXJ	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 422.86 V (2) 420.93 V (3) 421.41 V	P
5	Control IC Voltage Test	U 1 Rated： PFC FAN6921MR 17V~30V	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 22.145 V (2) 20.801 V (3) 20.796 V	P
6	Power Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated： STP11NK50ZFP 10A/500V	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta：25℃	(1) 454 V (2) 440 V (3) 442 V	P

■ SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P： 3 .75KVAC/min	I/P-O/P： 4 KVAC/min Ta：25℃	I/P-O/P： 2.474 mA NO DAMAGE	P
2	ISOLATION RESISTANCE	I/P-O/P：500VDC>100MΩ	I/P-O/P： 500 VDC Ta：25℃/70%RH	I/P-O/P： 30 GΩ NO DAMAGE	P
3	APPROVAL	TUV： Certificate NO ： UL： File NO ：			N/A

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS C	I/P:230VAC/240VAC/220VAC50HZ O/P:100%,75%,60%LOAD CLASS C ≧60% Ta:25℃	PASS	P
2	CONDUCTION	EN55015 CLASS B	I/P: 230 VAC (50HZ)/115V[60HZ] O/P:FULL/60% LOAD Ta:25℃	PASS Test by certified Lab	P
3	RADIATION	EN55015 CLASS B	I/P: 230 VAC (50HZ)/115V[60HZ] O/P:FULL LOAD Ta:25℃	PASS Test by certified Lab	P
4	E.S.D	AIR:8KV / Contact:6KV INDUSTRY	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A	P
5	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A	P
6	SURGE	IEC61000-4-5 INDUSTRY L-N :2KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A	P
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：LPF-60-12
1. ROOM AMBIENT　BURN-IN：4 HRS
I/P： 230VAC　O/P：95%LOAD　Ta=28.3℃
2. HIGH AMBIENT　BURN-IN： 2.5 HRS
I/P： 230VAC　O/P： 95% LOAD　Ta=54.1℃
<table>
<tr><th>NO</th><th>Position</th><th>P/N</th><th>ROOM AMBIENT Ta=28.3 ℃</th><th>HIGH AMBIENT Ta= 54.1 ℃</th></tr>
<tr><td>1</td><td>L1</td><td>TR853A</td><td>51.8℃</td><td>75.5℃</td></tr>
<tr><td>2</td><td>BD1</td><td>4A/800V　SILICON UR4KB80</td><td>50.4℃</td><td>74.2℃</td></tr>
<tr><td>3</td><td>Q1</td><td>STP11NK50ZFP 10A/500V</td><td>56.9℃</td><td>80.2℃</td></tr>
<tr><td>4</td><td>D2</td><td>2A/800V GP20K</td><td>70.2℃</td><td>94.3℃</td></tr>
<tr><td>5</td><td>Q3</td><td>2SK3673-01MR 10A/700V</td><td>70.5℃</td><td>94.2℃</td></tr>
<tr><td>6</td><td>C16</td><td>22u/50V UL10Kh 5*11 YXM</td><td>61.2℃</td><td>84.7℃</td></tr>
<tr><td>7</td><td>U1</td><td>PFC FAN6921MR</td><td>62.2℃</td><td>86.1℃</td></tr>
<tr><td>8</td><td>C201</td><td>47u/50V UL10Kh 6.3*11 YXM</td><td>67.8℃</td><td>91.6℃</td></tr>
<tr><td>9</td><td>RTH2</td><td>NTC 100KΩ 3Φ
TTC3A104F4193EY 1%</td><td>59.5℃</td><td>82.9℃</td></tr>
<tr><td>10</td><td>C5</td><td>47u/450V 105℃ 16*25 KXJ</td><td>58.3℃</td><td>81.5℃</td></tr>
<tr><td>11</td><td>C105</td><td>820u/25V UL10Kh 10*20 ZLH</td><td>72.4℃</td><td>96.9℃</td></tr>
<tr><td>13</td><td>D101</td><td>PFR30L60CT 30A/60V</td><td>75.7℃</td><td>100.7℃</td></tr>
<tr><td>14</td><td>C111</td><td>330u/25V UL8Kh 8*11.5 ZLH</td><td>68.6℃</td><td>92.7℃</td></tr>
<tr><td>15</td><td>LF100</td><td>TR895-R2</td><td>68.4℃</td><td>92.8℃</td></tr>
<tr><td>16</td><td>D1</td><td>MUR460 4A/600V</td><td>58.8℃</td><td>82.0℃</td></tr>
<tr><td>17</td><td>LF1</td><td>TR732A-R1</td><td>40.3℃</td><td>64.1℃</td></tr>
<tr><td>18</td><td>T1</td><td>TF2222</td><td>53.6℃</td><td>77.5℃</td></tr>
</table></td><td>P</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： 95 % LOAD
Ta= -30 ℃</td><td>TEST：OK</td><td>P</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： 305 VAC
O/P：95% LOAD
Ta= 50 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td><td>P</td></tr>
<tr><td>4</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03 %(0~50℃)</td><td>I/P： 230 VAC
O/P：95% LOAD</td><td>± 0.01 %(0~50℃)</td><td>P</td></tr>
<tr><td>5</td><td>STORAGE TEMPERATURE
TEST</td><td colspan="2">1. Thermal shock Temperature： -45℃~ +90℃
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>P</td></tr>
<tr><td>6</td><td>THERMAL SHOCK TEST</td><td colspan="2">1. Thermal shock Temperature： -35℃~ +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>P</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：72min in each axis (X.Y.Z) (6) Ta：25℃	TEST：OK	P
8	CAPACITOR LIFE CYCLE	LPF-60-12: 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	(1) 125577 HRS (2) 24302 HRS (3) 41094 HRS	P
9	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE：440.5 HRS		P
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 30,000 hours @ Tcase 80℃; 50,000 hours @ Tcase70℃		P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2010/11/11	RD SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2010/11/25	PRODUCT SAMPLE	PASS	SANFORD SU	VINCENT TSENG

■ 2009/08/04 A50-F023