



# Test Report: LPF-90-36

---

90W 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 : 200 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 24.6 mVp-p (Max)	P
2	CONSTANT CURRENT REGION	V1= 21.6V~36V	I/P : 230VAC O/P : CV MODE Ta : 25°C	O/P= 35V/ 2.539 A O/P= 21.6V/ 2.542 A	P
3	OUTPUT VOLTAGE TOLERANCE	V1 : 4 %~ -4 % (Max)	I/P : 100 VAC / 305 VAC O/P : FULL/ MIN LOAD Ta : 25°C	V1 : 0.1 %~ -0.1 %	P
4	LINE REGULATION	V1 : 0.5 %~ -0.5 % (Max)	I/P : 100 VAC ~ 305 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0 %~ -0.1 %	P
5	LOAD REGULATION	V1 : 0.5 %~ -0.5 % (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.06 %~ -0.08 %	P
6	SET UP TIME	230VAC : 500 ms (Max) 115VAC : 1200 ms(Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 267 ms 115VAC/ 294 ms	P
7	RISE TIME	230VAC : 200 ms (Max) 115VAC : 200 ms (Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 28.954 ms 115VAC/ 24.754 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°C	230VAC/ 74.271 ms 115VAC/ 32.328 ms	P
9	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	TEST : <5 %	P
10	DYNAMIC LOAD	V1 : 3600 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°C	(1)378 mVp-p (2)858 mVp-p	P

**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°C  I/P : LOW-LINE-3V=97 V HIGH-LINE=305 V O/P : FULL/MIN LOAD ON : 30 Sec . OFF : 30 Sec 10MIN ( AC POWER ON/OFF NO DAMAGE )	79.94 V~305V  TEST : OK	P
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE OSC	I/P : 100 VAC ~ 305 VAC O/P : FULL-MIN LOAD Ta : 25°C	TEST : OK	P
3	POWER FACTOR	0.96 / 230 VAC(TYP) 0.97 / 115 VAC(TYP) 0.95 / 277 VAC(TYP)	I/P : 230 VAC I/P : 115 VAC I/P : 277 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.9905 / 100% PF= 0.9976 / 100% PF= 0.9851 / 100%	P
4	EFFICIENCY	91% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	91.355 %	P
5	INPUT CURRENT	230V/ 0.5 A (TYP) 115V/ 0.95 A (TYP) 277V/ 0.4 A (TYP)	I/P : 230 VAC I/P : 115 VAC I/P : 277 VAC O/P : FULL LOAD Ta : 25°C	I = 0.4313 A/ 230 VAC I = 0.8702 A/ 115 VAC I = 0.3644 A/ 277 VAC	P
6	INRUSH CURRENT	230V/ 55 A (TYP) COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 57.679 A/ 230 VAC	P
7	LEAKAGE CURRENT	< 0.75 mA / 277 VAC	I/P : 277 VAC O/P : Min LOAD Ta : 25°C	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°C	101.52%/ 230 VAC 101.6%/ 115 VAC Constant Current Limiting ,recovers automatically after fault condition is removed.	P
2	OVER VOLTAGE PROTECTION	CH1 : 41 V ~ 46 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	44.4V/ 230 VAC 44.4V/ 115 VAC Shut down o/p voltage, re-power on to recover	P
3	OVER TEMPERATURE PROTECTION	SPEC : RTH2 : 90± 10°C 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°C	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 2 Rated : TK10A60D 10A/600V	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) 440 V (2) 440 V (3) 420 V	P
2	Diode Peak Voltage	Q101 Rated : STPS20170C 20A/170V	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) 152 V (2) 118 V (3) 154 V	P
3	Input Capacitor Voltage	C5 Rated : 82u/450V 105°C	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°C	(1) 444 V (2) 436 V (3) 440 V	P
4	Control IC Voltage Test	U 1 Rated : TEA1752T 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°C	(1) 22.2 V (2) 21.4 V (3) 21.4 V	P
5	Power Transistor ( D to S) or (C to E) Peak Voltage	Q1 Rated : 2SK3677-01MR 12A/700V	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) 604 V (2) 496 V (3) 620 V	P

**■ SAFETY & E.M.C. TEST**
**SAFETY TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P : 3.75 KVAC/min	I/P-O/P : 4 KVAC/min Ta : 25°C	I/P-O/P : 3.87 mA NO DAMAGE	P
2	ISOLATION RESISTANCE	I/P-O/P : 500VDC>100MΩ	I/P-O/P : 500 VDC Ta : 25°C/70% RH	I/P-O/P : 6.09 GΩ NO DAMAGE	P

**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°C	PASS	P
2	CONDUCTION	EN55022 CLASS B	I/P: 230 VAC (50HZ)/115V[60HZ] O/P:FULL/60% LOAD Ta:25°C	PASS Test by certified Lab	P
3	RADIATION	EN55022 CLASS B	I/P: 230 VAC (50HZ)/115V[60HZ] O/P:FULL LOAD Ta:25°C	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°C	CRITERIA A	P
5	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A	P
6	SURGE	IEC61000-4-5 INDUSTRY L-N :2KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A	P
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 : LPF-90-24 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 230VAC O/P : 95% LOAD Ta=37.5 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : 95% LOAD Ta=51.6°C			P																																																																																																																			
		<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>P/N</th> <th>ROOM AMBIENT Ta=37.5°C</th> <th>HIGH AMBIENT Ta= 51.6°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>TR-990</td><td>59.5°C</td><td>72.1°C</td></tr> <tr><td>2</td><td>LF2</td><td>TR-910B</td><td>68.9°C</td><td>81.4°C</td></tr> <tr><td>3</td><td>L1</td><td>TR-995</td><td>67.3°C</td><td>79.6°C</td></tr> <tr><td>4</td><td>C11</td><td>564/450V</td><td>70.7°C</td><td>83.1°C</td></tr> <tr><td>5</td><td>D6</td><td>MUR460</td><td>71.7°C</td><td>84.0°C</td></tr> <tr><td>6</td><td>Q2</td><td>TK10A60D</td><td>73.4°C</td><td>86.1°C</td></tr> <tr><td>7</td><td>L3</td><td>TF-2157</td><td>69.1°C</td><td>80.9°C</td></tr> <tr><td>8</td><td>Q1</td><td>2SK3677</td><td>77.2°C</td><td>90.6°C</td></tr> <tr><td>9</td><td>C5</td><td>82u/450V KXG</td><td>72.2°C</td><td>84.4°C</td></tr> <tr><td>10</td><td>D12</td><td>GP20K</td><td>78.1°C</td><td>91.3°C</td></tr> <tr><td>11</td><td>T1</td><td>TF-2161</td><td>79.8°C</td><td>92.4°C</td></tr> <tr><td>12</td><td>U1</td><td>TEA1752T</td><td>70.7°C</td><td>82.9°C</td></tr> <tr><td>13</td><td>C22</td><td>47uF/50V YXM</td><td>70.7°C</td><td>83.1°C</td></tr> <tr><td>14</td><td>C18</td><td>33u/50V YXM</td><td>71.7°C</td><td>82.4°C</td></tr> <tr><td>15</td><td>C152</td><td>47uF/50V YXM</td><td>73.6°C</td><td>86.2°C</td></tr> <tr><td>16</td><td>C153</td><td>47uF/50V YXM</td><td>76.4°C</td><td>94.2°C</td></tr> <tr><td>17</td><td>Q101</td><td>STP40NF12</td><td>78.6°C</td><td>93.1°C</td></tr> <tr><td>18</td><td>C106</td><td>1000u/35V ZLH</td><td>71.1°C</td><td>84.4°C</td></tr> <tr><td>19</td><td>C107</td><td>1000u/35V ZLH</td><td>67.8°C</td><td>81.2°C</td></tr> <tr><td>20</td><td>L100</td><td>TR-884</td><td>65.8°C</td><td>79.3°C</td></tr> <tr><td>21</td><td>U151</td><td>LM224ADT</td><td>65.7°C</td><td>78.7°C</td></tr> <tr><td>22</td><td>RTH2</td><td>100KΩ 3Φ 1%</td><td>68.1°C</td><td>80.6°C</td></tr> </tbody> </table>	NO	Position		P/N	ROOM AMBIENT Ta=37.5°C	HIGH AMBIENT Ta= 51.6°C	1	LF1	TR-990	59.5°C	72.1°C	2	LF2	TR-910B	68.9°C	81.4°C	3	L1	TR-995	67.3°C	79.6°C	4	C11	564/450V	70.7°C	83.1°C	5	D6	MUR460	71.7°C	84.0°C	6	Q2	TK10A60D	73.4°C	86.1°C	7	L3	TF-2157	69.1°C	80.9°C	8	Q1	2SK3677	77.2°C	90.6°C	9	C5	82u/450V KXG	72.2°C	84.4°C	10	D12	GP20K	78.1°C	91.3°C	11	T1	TF-2161	79.8°C	92.4°C	12	U1	TEA1752T	70.7°C	82.9°C	13	C22	47uF/50V YXM	70.7°C	83.1°C	14	C18	33u/50V YXM	71.7°C	82.4°C	15	C152	47uF/50V YXM	73.6°C	86.2°C	16	C153	47uF/50V YXM	76.4°C	94.2°C	17	Q101	STP40NF12	78.6°C	93.1°C	18	C106	1000u/35V ZLH	71.1°C	84.4°C	19	C107	1000u/35V ZLH	67.8°C	81.2°C	20	L100	TR-884	65.8°C	79.3°C	21	U151	LM224ADT	65.7°C	78.7°C	22	RTH2	100KΩ 3Φ 1%	68.1°C	80.6°C		
NO	Position	P/N	ROOM AMBIENT Ta=37.5°C	HIGH AMBIENT Ta= 51.6°C																																																																																																																				
1	LF1	TR-990	59.5°C	72.1°C																																																																																																																				
2	LF2	TR-910B	68.9°C	81.4°C																																																																																																																				
3	L1	TR-995	67.3°C	79.6°C																																																																																																																				
4	C11	564/450V	70.7°C	83.1°C																																																																																																																				
5	D6	MUR460	71.7°C	84.0°C																																																																																																																				
6	Q2	TK10A60D	73.4°C	86.1°C																																																																																																																				
7	L3	TF-2157	69.1°C	80.9°C																																																																																																																				
8	Q1	2SK3677	77.2°C	90.6°C																																																																																																																				
9	C5	82u/450V KXG	72.2°C	84.4°C																																																																																																																				
10	D12	GP20K	78.1°C	91.3°C																																																																																																																				
11	T1	TF-2161	79.8°C	92.4°C																																																																																																																				
12	U1	TEA1752T	70.7°C	82.9°C																																																																																																																				
13	C22	47uF/50V YXM	70.7°C	83.1°C																																																																																																																				
14	C18	33u/50V YXM	71.7°C	82.4°C																																																																																																																				
15	C152	47uF/50V YXM	73.6°C	86.2°C																																																																																																																				
16	C153	47uF/50V YXM	76.4°C	94.2°C																																																																																																																				
17	Q101	STP40NF12	78.6°C	93.1°C																																																																																																																				
18	C106	1000u/35V ZLH	71.1°C	84.4°C																																																																																																																				
19	C107	1000u/35V ZLH	67.8°C	81.2°C																																																																																																																				
20	L100	TR-884	65.8°C	79.3°C																																																																																																																				
21	U151	LM224ADT	65.7°C	78.7°C																																																																																																																				
22	RTH2	100KΩ 3Φ 1%	68.1°C	80.6°C																																																																																																																				
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 305VAC/100VAC O/P : 95 % LOAD Ta= -40 °C / -25°C	TEST : OK	P																																																																																																																			
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE	I/P : 305 VAC O/P : 95% LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK	P																																																																																																																			
4	TEMPERATURE COEFFICIENT	± 0.03 %(0-50°C)	I/P : 230 VAC O/P : 95% LOAD	± 0%(0-50°C)	P																																																																																																																			
5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~ +90°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	P																																																																																																																			

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	P
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	P
8	CAPACITOR LIFE CYCLE	SUPPOSE C106 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) 289437 HRS (2) 54102 HRS (3) 74884 HRS (4) 108205 HRS	P
9	MTBF	Conducted by Parts Stress Analysis Prediction 3292.9K hrs min. Telcordia SR-332 (Bellcore); 301.7K hrs min. MIL-HDBK-217F (25°C)		P
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50,000 hours @ Tcase 70°C		P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2011/5/13	RD SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2011/5/25	PRODUCT SAMPLE	PASS	SANFORD SU	VINCENT TSENG

2009/08/04 A50-F023