Test Report: LPF-16D-20

16W 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： 20 mVp-p (Max)	P
2	CONSTANT CURRENT REGION	V1= 11V~20V	I/P： 230VAC O/P：CV MODE Ta：25℃	O/P= 11V： 0.825 A O/P= 19V： 0.824 A	P
3	OUTPUT VOLTAGE TOLERANCE	V1： 4 %~ -4 % (Max)	I/P：100 VAC / 305 VAC O/P：FULL/ MIN LOAD Ta：25℃	V1： 0.950 %~ -0.120 %	P
4	LINE REGULATION	V1： 0.5 %~ -0.5 % (Max)	I/P：100 VAC ~ 305 VAC O/P：FULL LOAD Ta：25℃	V1： 0.005 %~ -0.005 %	P
5	LOAD REGULATION	V1： 1 %~ -1 % (Max)	I/P： 230 VAC O/P：FULL ~MIN LOAD Ta：25℃	V1： 0.060 %~ -0.060 %	P
6	SET UP TIME	230VAC： 500 ms (Max) 115VAC： 1500 ms(Max)	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 319.904 ms 115VAC/ 302.274 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/ 12 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/ 125 ms 115VAC/ 125 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) 171 mVp-p (2) 308 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)

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	0.064A	0.144A	0.222A	0.302A	0.389A	0.470A	0.552A	0.635A	0.720A	0.795A
	%	8.00%	18.00%	27.75%	37.75%	48.63%	58.75%	69.00%	79.38%	90.00%	99.38%
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
	Output current	0.066A	0.145A	0.225A	0.304A	0.391A	0.473A	0.555A	0.638A	0.723A	0.801A
	%	8.25%	18.13%	28.13%	38.00%	48.88%	59.13%	69.38%	79.75%	90.34%	100.1%
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Output current	0.068A	0.147A	0.227A	0.305A	0.393A	0.477A	0.560A	0.641A	0.727A	0.804A
	%	8.50%	18.34%	28.38%	38.13%	49.13%	59.63%	70.00%	80.13%	90.88%	100.5%

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℃	85 V~305V	P
			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)	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) 0.97 / 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= 0.967 / 100% PF= 0.995 / 100% PF= 0.937 / 100%	P
4	EFFICIENCY	84.5% (TYP)	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	84.55 %	P
5	INPUT CURRENT	230V/ 0.25 A (TYP) 115V/ 0.4 A (TYP) 277V/ 0.2 A (TYP)	I/P： 230 VAC I/P： 115 VAC I/P： 277 VAC O/P：FULL LOAD Ta：25℃	I = 0.083 A/ 230 VAC I = 0.162 A/ 115 VAC I = 0.071 A/ 277 VAC	P
6	INRUSH CURRENT	230V/ 50 A (TYP) COLD START	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I = 34.1 A/ 230 VAC	P
7	LEAKAGE CURRENT	< 0.75 mA / 240 VAC	I/P： 240 VAC O/P：Min LOAD Ta：25℃	L-CASE： 0.003 mA N-CASE： 0.003 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℃	103.16 %/ 230 VAC 103.18%/ 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℃	25.8 V/ 230 VAC 25.8 V/ 115 VAC Shut down and latch off o/p voltage, re-power on to recover	P
3	OVER TEMPERATURE PROTECTION	SPEC： TSW1： 100± 5℃ O.T.P. NO DAMAGE	I/P： 230 VAC O/P：FULL LOAD	O.T.P. Active Shut down o/p voltage，recovers automatically after temperature goes down	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	U2 Rated： IP7518: 700V / 2A	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2) Output Short (3)Full load continue Ta：25℃	(1) 632 V (2) 460 V (3) 616 V	P
2	Diode Peak Voltage	D101 Rated： V30100C: 100V / 30A	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(1) 78.4 V (2) 60.4 V (3) 76.8 V	P
3	Input Capacitor Voltage	C5 Rated： 22u/450V 105℃ 16*20 RH	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) 440 V (2) 438 V (3) 428 V	P
4	Control IC Voltage Test	U 2 Rated： IP7518:30V	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) 19.9 V (2) 13.2 V (3) 19.4 V	P
5	Power Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated： NDF10N60ZG: 600V/ 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) 466 V (2) 428 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： 3.75 KVAC/min	I/P-O/P： 4 KVAC/min Ta：25℃	I/P-O/P： 1.442 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： >9999 MΩ 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%,50%LOAD CLASS C ≧ 50% Ta:25℃	PASS	P
2	CONDUCTION	EN55015	I/P: 230 VAC (50HZ)/115V[60HZ] O/P:FULL/50% LOAD Ta:25℃	PASS Test by certified Lab	P
3	RADIATION	EN55015	I/P: 230 VAC (50HZ)/115V[60HZ] O/P:FULL LOAD Ta:25℃	PASS Test by certified Lab	P
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	P
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	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

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	TEMPERATURE RISE TEST	MODEL： LPF-16D-12 1. ROOM AMBIENT BURN-IN：2.5 HRS I/P： 230VAC O/P： 95% LOAD Ta=32.2 ℃ 2. HIGH AMBIENT BURN-IN：3.5 HRS I/P： 230VAC O/P： 95% LOAD Ta=50.1 ℃			P
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 305VAC/100VAC O/P： 95 % LOAD Ta= -40℃	TEST：OK	P
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 ℃ NO DAMAGE	I/P： 305 VAC O/P：95% LOAD Ta= 50 ℃ HUMIDITY= 95 %R.H	TEST：OK	P
4	TEMPERATURE COEFFICIENT	± 0.03 %(0~50℃)	I/P： 230 VAC O/P：95% LOAD	± 0.002 %(0~50℃)	P
5	STORAGE TEMPERATURE TEST	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		OK	P
6	THERMAL SHOCK TEST	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		OK	P

NO	Position	P/N	ROOM AMBIENT Ta= 32.20 ℃	HIGH AMBIENT Ta= 50.1 ℃
1	LF2	LF-802	55.6℃	72.5℃
2	BD1	UD2KB80	62.2℃	77.8℃
3	L1	TR-6102	62.3℃	78.1℃
4	Q1	NDF10N60ZG	66.6℃	82.5℃
5	D1	MUR460	69.4℃	86.1℃
6	C18	47uF/50V YXM	66.8℃	83.0℃
7	C54	22uF/50V YXM	70.2℃	87.5℃
8	C5	22uF/450V RH	68.3℃	86.2℃
9	U1	NCP1608B	68.9℃	84.8℃
10	U2	IP7518	86.8℃	104.8℃
11	T1	TF-6357	70.4℃	87.1℃
12	D101	PFR30L60CT 30A/60V	63.5℃	78.8℃
13	C105	560u/25V ZLH	59.9℃	75.9℃

7	VIBRATION TEST	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (3) Sweep Time：12min/sweep cycle (4) Acceleration：2G (5) Test Time：72min in each axis (X.Y.Z) (6) Ta：25℃	TEST：OK	P
8	CAPACITOR LIFE CYCLE	LPF-16D-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) 452611.8 HRS (2) 91294.2 HRS (3) 119635.2 HRS	P
9	MTBF	Conducted by Parts Stress Analysis Prediction 3572.8K hrs min. Telcordia SR-332 (Bellcore)； 391.6K hrs min. MIL-HDBK-217F (25℃)		P
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life)： 50,000 hours @ Tcase70℃		P

SAMPLE	TEST RESULT	TESTER	APPROVAL
PRODUCT SAMPLE	PASS	ZOULF	HOWAY

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