



Test Report: LPF-16D-36

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 : 250 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 98 mVp-p (Max)	P
2	CONSTANT CURRENT REGION	V1= 19.8V~36V	I/P : 230VAC O/P : CV MODE Ta : 25°C	O/P= 19.8V : 0.464 A O/P= 35V : 0.465 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 : 0.556 %~ -0.019 %	P
4	LINE REGULATION	V1 : 0.5 %~ -0.5 % (Max)	I/P : 100 VAC ~ 305 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0.003 %~ -0.003 %	P
5	LOAD REGULATION	V1 : 0.5 %~ -0.5 % (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.022 %~ -0.019 %	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°C	230VAC/ 285.069 ms 115VAC/ 236.733 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°C	230VAC/ 22 ms 115VAC/ 22 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/ 127 ms 115VAC/ 127 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) 276 mVp-p (2) 436 mVp-p	P

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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°C

1	Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K
	Output current	0.031A	0.077A	0.125A	0.173A	0.217A	0.264A	0.311A	0.359A	0.405A	0.447A
	%	6.89%	17.11%	27.78%	38.44%	48.22%	58.76%	69.11%	79.78%	90.00%	99.33%
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
	Output current	0.033A	0.079A	0.126A	0.174A	0.219A	0.266A	0.312A	0.361A	0.406A	0.448A
	%	7.33%	17.56%	28.00%	38.67%	48.67%	59.11%	69.33%	80.22%	90.22%	99.56%
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Output current	0.034A	0.080A	0.127A	0.174A	0.221A	0.267A	0.314A	0.361A	0.407A	0.449A
	%	7.56%	17.78%	28.22%	38.67%	49.11%	59.33%	69.78%	80.22%	90.44%	99.78%

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)	85 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	0.95 / 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°C	PF= 0.965 / 100% PF= 0.995 / 100% PF= 0.938 / 100%	P
4	EFFICIENCY	85% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	85.06 %	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°C	I= 0.084 A/ 230 VAC I= 0.166 A/ 115 VAC I= 0.072 A/ 277 VAC	P
6	INRUSH CURRENT	230V/ 50 A (TYP) COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I= 35.7 A/ 230 VAC	P
7	LEAKAGE CURRENT	< 0.75 mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	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°C	103.35 %/ 230 VAC 103.11 %/ 115 VAC Constant Current Limiting ,recovers automatically after fault condition is removed.	P
2	OVER VOLTAGE PROTECTION	CH1 : 41 V ~ 49 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	44.27 V/ 230 VAC 44.21 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°C 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°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	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°C	(1) 642 V (2) 480 V (3) 618 V	P
2	Diode Peak Voltage	D101 Rated : V20200C: 200V / 20A	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) 160 V (2) 148 V (3) 155 V	P
3	Input Capacitor Voltage	C5 Rated : 22u/450V 105°C 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°C	(1) 432 V (2) 434 V (3) 434 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°C	(1) 19.3 V (2) 13.2 V (3) 19.2 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°C	(1) 432 V (2) 438 V (3) 446 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 : 1.325 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 : >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°C	PASS	P
2	CONDUCTION	EN55015	I/P: 230 VAC (50HZ)/115V[60HZ] O/P:FULL/50% LOAD Ta:25°C	PASS Test by certified Lab	P
3	RADIATION	EN55015	I/P: 230 VAC (50HZ)/115V[60HZ] O/P:FULL LOAD Ta:25°C	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°C	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°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-16D-24 1. ROOM AMBIENT BURN-IN : 2.5 HRS I/P : 230VAC O/P : 95% LOAD Ta=32.2 °C 2. HIGH AMBIENT BURN-IN : 3.5 HRS I/P : 230VAC O/P : 95% LOAD Ta=50.1 °C <table><thead><tr><th>NO</th><th>Position</th><th>P/N</th><th>ROOM AMBIENT Ta= 32.2 °C</th><th>HIGH AMBIENT Ta= 50.1 °C</th></tr></thead><tbody><tr><td>1</td><td>LF2</td><td>LF-802</td><td>54.6°C</td><td>71.8°C</td></tr><tr><td>2</td><td>BD1</td><td>UD2KB80</td><td>60.7°C</td><td>77.0°C</td></tr><tr><td>3</td><td>L1</td><td>TR-6102</td><td>61.5°C</td><td>78.2°C</td></tr><tr><td>4</td><td>Q1</td><td>NDF10N60ZG</td><td>66.7°C</td><td>83.7°C</td></tr><tr><td>5</td><td>D1</td><td>MUR460</td><td>67.4°C</td><td>84.8°C</td></tr><tr><td>6</td><td>C18</td><td>47uF/50V YXM</td><td>64.6°C</td><td>81.4°C</td></tr><tr><td>7</td><td>C54</td><td>22uF/50V YXM</td><td>65.1°C</td><td>83.3°C</td></tr><tr><td>8</td><td>C5</td><td>22uF/450V RH</td><td>63.0°C</td><td>81.5°C</td></tr><tr><td>9</td><td>U1</td><td>NCP1608B</td><td>68.5°C</td><td>84.7°C</td></tr><tr><td>10</td><td>U2</td><td>IP7518</td><td>77.8°C</td><td>97.0°C</td></tr><tr><td>11</td><td>T1</td><td>TF-6360</td><td>62.8°C</td><td>80.9°C</td></tr><tr><td>12</td><td>D101</td><td>YA868C12R</td><td>54.6°C</td><td>71.3°C</td></tr><tr><td>13</td><td>C105</td><td>390u/35V ZLH</td><td>53.0°C</td><td>70.1°C</td></tr></tbody></table>			NO	Position	P/N	ROOM AMBIENT Ta= 32.2 °C	HIGH AMBIENT Ta= 50.1 °C	1	LF2	LF-802	54.6°C	71.8°C	2	BD1	UD2KB80	60.7°C	77.0°C	3	L1	TR-6102	61.5°C	78.2°C	4	Q1	NDF10N60ZG	66.7°C	83.7°C	5	D1	MUR460	67.4°C	84.8°C	6	C18	47uF/50V YXM	64.6°C	81.4°C	7	C54	22uF/50V YXM	65.1°C	83.3°C	8	C5	22uF/450V RH	63.0°C	81.5°C	9	U1	NCP1608B	68.5°C	84.7°C	10	U2	IP7518	77.8°C	97.0°C	11	T1	TF-6360	62.8°C	80.9°C	12	D101	YA868C12R	54.6°C	71.3°C	13	C105	390u/35V ZLH	53.0°C	70.1°C	P
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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 305VAC/100VAC O/P : 95 % LOAD Ta= -40°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	± 0.017 %(0~50°C)	P																																																																						
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	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 : 2G (5) Test Time : 72min in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK	P
8	CAPACITOR LIFE CYCLE	LPF-16D-24: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	(1) 741737.5 HRS (2) 138547.5 HRS (3) 168315 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°C)		P
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50,000 hours @ Tcase70°C		P

SAMPLE	TEST RESULT	TESTER	APPROVAL
PRODUCT SAMPLE	PASS	ZOULF	HOWAY

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