



Test Report: LPF-16D-42

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 : 35 mVp-p (Max) | P |
| 2 | CONSTANT CURRENT REGION | V1= 21V-42V | I/P : 230VAC O/P : CV MODE Ta : 25°C | O/P= 21V : 0.396 A O/P= 41V : 0.397 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 : 0.238 %~ -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 : 0.024 %~ 0 % | P |
| 5 | LOAD REGULATION | V1 : 0.5 %~ -0.5 % (Max) | I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C | V1 : 0.024 %~ -0.024 % | 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/ 295.396 ms 115VAC/ 283.547 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/ 26 ms 115VAC/ 26 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/ 121 ms 115VAC/ 123 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 : 4200 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) 378 mVp-p | P |

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|--|------------------|---|--------|--------|--------|--------|--------|--------|--------|--------|------------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|----------------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 11 | DIMMER TEST | <p>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> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <tr> <td>Resistance value</td> <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> <td>Output current</td> <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 current | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% | | | | | | | | | | |
| | | Resistance value | 10K | 20K | 30K | 40K | 50K | 60K | 70K | 80K | 90K | 100K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Output current | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <p>*1 ~ 10V dimming function for output current adjustment (Typical)</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <tr> <td>Dimming value</td> <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> <td>Output current</td> <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> | | | | | | | | | | Dimming value | 1V | 2V | 3V | 4V | 5V | 6V | 7V | 8V | 9V | 10V | Output current | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% | | | | | | | | | | |
| | | Dimming value | 1V | 2V | 3V | 4V | 5V | 6V | 7V | 8V | 9V | 10V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Output current | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <p>*10V PWM signal for output current adjustment (Typical)</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <tr> <td>Duty value</td> <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> <td>Output current</td> <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> | | | | | | | | | | Duty value | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% | Output current | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% | | | | | | | | | | |
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| Output current | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>TEST RESULT: I/P : 230 VAC ; Ta : 25°C</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td rowspan="3">1</td> <td>Resistance value</td> <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> <td>Output current</td> <td>0.024A</td> <td>0.062A</td> <td>0.102A</td> <td>0.145A</td> <td>0.185A</td> <td>0.229A</td> <td>0.269A</td> <td>0.310A</td> <td>0.349A</td> <td>0.385A</td> </tr> <tr> <td>%</td> <td>6.15%</td> <td>15.90%</td> <td>26.15%</td> <td>37.18%</td> <td>47.44%</td> <td>58.72%</td> <td>68.97%</td> <td>79.49%</td> <td>89.49%</td> <td>98.72%</td> </tr> </table> | | | | | | | | | | 1 | Resistance value | 10K | 20K | 30K | 40K | 50K | 60K | 70K | 80K | 90K | 100K | Output current | 0.024A | 0.062A | 0.102A | 0.145A | 0.185A | 0.229A | 0.269A | 0.310A | 0.349A | 0.385A | % | 6.15% | 15.90% | 26.15% | 37.18% | 47.44% | 58.72% | 68.97% | 79.49% | 89.49% | 98.72% |
| 1 | Resistance value | 10K | 20K | 30K | 40K | 50K | 60K | 70K | 80K | | 90K | 100K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Output current | 0.024A | 0.062A | 0.102A | 0.145A | 0.185A | 0.229A | 0.269A | 0.310A | | 0.349A | 0.385A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | % | 6.15% | 15.90% | 26.15% | 37.18% | 47.44% | 58.72% | 68.97% | 79.49% | 89.49% | 98.72% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 2 | Dimming value | 1V | 2V | 3V | 4V | 5V | 6V | 7V | 8V | | 9V | 10V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Output current | 0.025A | 0.064A | 0.105A | 0.147A | 0.188A | 0.231A | 0.271A | 0.312A | | 0.352A | 0.388A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | % | 6.41% | 16.41% | 26.92% | 37.69% | 48.21% | 59.23% | 69.49% | 80.00% | 90.26% | 99.49% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 3 | Duty value | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | | 90% | 100% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Output current | 0.027A | 0.065A | 0.106A | 0.148A | 0.189A | 0.231A | 0.272A | 0.313A | | 0.352A | 0.389A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | % | 6.92% | 16.67% | 27.18% | 37.95% | 48.46% | 59.23% | 69.74% | 80.26% | 90.26% | 99.74% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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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= 0.968 / 100% PF= 0.995 / 100% PF= 0.940 / 100% | P |
| 4 | EFFICIENCY | 86% (TYP) | I/P : 230 VAC O/P : FULL LOAD Ta : 25°C | 86.38 % | 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 = 35.3 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 | 102.33 %/ 230 VAC 102.46 %/ 115 VAC Constant Current Limiting ,recovers automatically after fault condition is removed. | P |
| 2 | OVER VOLTAGE PROTECTION | CH1 : 46 V ~ 54 V | I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C | 48.69 V/ 230 VAC 48.41 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) 640 V (2) 480 V (3) 624 V | P |
| 2 | Diode Peak Voltage | D101 Rated : STTH3002CT: 200V / 30A | 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) 175 V (2) 125 V (3) 179 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) 440 V (2) 438 V (3) 436 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) 20.0 V (2) 14.0 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) 552 V (2) 456 V (3) 452 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 : 1.406 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/50% 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 | | | 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 |



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|----|-----------------------------|--|--|---|
| 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 |

2009/08/04 A50-F023