



# Test Report: HLN-60H-48

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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   |
|----|-----------------------------|---|---|--|
| 1  | RIPPLE & NOISE              | V1 : 300 mVp-p (Max)                          | I/P : 230VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | V1 : 23 mVp-p (Max)  |
| 2  | OUTPUT VOLTAGE ADJUST RANGE | CH1 : 44 V ~ 53 V                             | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : MIN LOAD<br>Ta : 25°C   | 43.026 V ~ 55.60 V / 230 VAC<br>43.028 V ~ 55.61 V / 115 VAC |
| 3  | CURRENT ADJUST RANGE        | CH1 : 0.78A ~ 1.3A                            | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : MIN LOAD<br>Ta : 25°C   | 0.704 A ~ 1.374 A / 230 VAC<br>0.705 A ~ 1.376 A / 115 VAC   |
| 4  | OUTPUT VOLTAGE TOLERANCE    | V1 : 1 %~ -1 % (Max)                          | I/P : 100 VAC / 305VAC<br>O/P : FULL/ MIN LOAD<br>Ta : 25°C   | V1 : 0.3 %~ -0.3 %   |
| 5  | LINE REGULATION             | V1 : 0.5 %~ -0.5 % (Max)                      | I/P : 100VAC ~ 305VAC<br>O/P : FULL LOAD<br>Ta : 25°C   | V1 : 0.15 %~ -0.15 %   |
| 6  | LOAD REGULATION             | V1 : 0.5 %~ -0.5 % (Max)                      | I/P : 230 VAC<br>O/P : FULL ~MIN LOAD<br>Ta : 25°C  | V1 : 0.3 %~ -0.3 %   |
| 7  | SET UP TIME                 | 230VAC : 500 ms (Max)<br>115VAC : 500 ms(Max) | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | 230VAC/ 356 ms<br>115VAC/ 303 ms                             |
| 8  | RISE TIME                   | 230VAC : 80 ms (Max)<br>115VAC : 80 ms (Max)  | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | 230VAC/ 26 ms<br>115VAC/ 26 ms                               |
| 9  | HOLD UP TIME                | 230VAC : 16 ms (TYP)<br>115VAC : 16 ms (TYP)  | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | 230VAC/ 75 ms<br>115VAC/ 22 ms                               |
| 10 | OVER/UNDERSHOOT TEST        | < ±5%   | I/P : 230 VAC<br>O/P : FULL LOAD<br>Ta : 25°C   | TEST : <5 %  |
| 11 | DYNAMIC LOAD                | V1 : 4800 mVp-p                               | I/P : 230 VAC<br>(1).O/P : FULL /Min LOAD 90%DUTY/<br>1KHZ<br>(2).O/P : FULL /Min LOAD 50%DUTY/<br>120HZ<br>Ta : 25°C | (1)151 mVp-p<br>(2)612 mVp-p                                 |

|    |                                  |  |        |        |        |        |        |        |        |        |         |      |
|----|----------------------------------|--|--------|--------|--------|--------|--------|--------|--------|--------|---------|------|
| 12 | DIMMER TEST<br>(for B-type only) | SPEC:  |        |        |        |        |        |        |        |        |         |      |
|    |                                  | * IP67 rated. Output constant current level can be adjusted through output cable by connecting a resistor or 1 ~ 10Vdc or 10V PWM signal between DIM+ and DIM- |        |        |        |        |        |        |        |        |         |      |
|    |                                  | *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                   | 0.105A   | 0.236A | 0.372A | 0.503A | 0.635A | 0.771A | 0.894A | 1.024A | 1.167A | 1.297A  |      |
|    | %                                | 8.08%  | 18.15% | 28.62% | 38.69% | 48.85% | 59.31% | 68.77% | 78.77% | 89.77% | 99.77%  |      |
| 2  | Dimming value                    | 1V   | 2V     | 3V     | 4V     | 5V     | 6V     | 7V     | 8V     | 9V     | 10V     |      |
|    | Output current                   | 0.106A   | 0.241A | 0.376A | 0.511A | 0.648A | 0.782A | 0.916A | 1.051A | 1.186A | 1.308A  |      |
|    | %                                | 8.15%  | 18.54% | 28.92% | 39.31% | 49.85% | 60.15% | 70.46% | 80.85% | 91.23% | 100.62% |      |
| 3  | Duty value                       | 10%  | 20%    | 30%    | 40%    | 50%    | 60%    | 70%    | 80%    | 90%    | 100%    |      |
|    | Output current                   | 0.142A   | 0.290A | 0.430A | 0.565A | 0.694A | 0.818A | 0.939A | 1.058A | 1.177A | 1.298A  |      |
|    | %                                | 10.92%   | 22.31% | 33.08% | 43.46% | 53.38% | 62.92% | 72.23% | 81.38% | 90.54% | 99.85%  |      |

**INPUT FUNCTION TEST**

| NO | TEST ITEM             | SPECIFICATION   | TEST CONDITION  | RESULT   |
|----|-----------------------|---|---|--|
| 1  | INPUT VOLTAGE RANGE   | 90VAC~305 VAC   | I/P : TESTING<br>O/P : FULL LOAD<br>Ta : 25°C   | 75 V~305V  |
|    |                       |   | I/P :<br>LOW-LINE-3V= 87 V<br>HIGH-LINE+10V=315 V<br>O/P : FULL/MIN LOAD<br>ON : 30 Sec . OFF : 30 Sec 10MIN<br>( AC POWER ON/OFF NO DAMAGE ) | TEST : OK  |
| 2  | INPUT FREQUENCY RANGE | 47HZ ~63 HZ<br>NO DAMAGE  | I/P : 90 VAC ~ 305 VAC<br>O/P : FULL -MIN LOAD<br>Ta : 25°C   | TEST : OK  |
| 3  | POWER FACTOR          | 0.95 / 230 VAC(TYP)<br>0.98 / 115 VAC(TYP)<br>0.92 / 277 VAC(TYP) | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C  | PF= 0.967 / 230 VAC<br>PF= 0.998 / 115 VAC<br>PF= 0.9392 / 277 VAC |
| 4  | EFFICIENCY            | 90.5 % (TYP)  | I/P : 230 VAC<br>O/P : FULL LOAD<br>Ta : 25°C   | 90.56 %  |
| 5  | INPUT CURRENT         | 277V/ 0.3 A (TYP)<br>230V/ 0.32 A (TYP)<br>115V/ 0.64 A (TYP)     | I/P : 277 VAC<br>I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : FULL LOAD<br>Ta : 25°C   | I = 0.26 A/ 277 VAC<br>I = 0.309 A/ 230 VAC<br>I = 0.60 A/ 115 VAC |
| 6  | INRUSH CURRENT        | 230V/ 55 A (TYP)<br><br>COLD START                                | I/P : 230 VAC<br><br>O/P : FULL LOAD<br>Ta : 25°C   | I = 58 A/ 230 VAC  |
| 7  | LEAKAGE CURRENT       | < 0.75 mA / 277 VAC   | I/P : 277 VAC<br>O/P : Min LOAD<br>Ta : 25°C  | L-FG : 0.22 mA<br>N-FG : 0.20 mA                                   |

**PROTECTION FUNCTION TEST**

| NO | TEST ITEM                   | SPECIFICATION                          | TEST CONDITION  | RESULT   |
|----|-----------------------------|--|---|--|
| 1  | OVER LOAD PROTECTION        | 95 % ~ 108 %                           | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : TESTING<br>Ta : 25°C  | 105 %/ 230 VAC<br>105 %/ 115 VAC<br>Constant current limiting, recovers automatically after fault condition is removed |
| 2  | OVER VOLTAGE PROTECTION     | CH1 : 54 V ~ 65 V                      | I/P : 230 VAC<br>I/P : 115 VAC<br>O/P : MIN LOAD<br>Ta : 25°C | 56.4 V/ 230 VAC<br>57.8 V/ 115 VAC<br>Shut down o/p voltage, re-power on to recover                                    |
| 3  | OVER TEMPERATURE PROTECTION | NO DAMAGE                              | I/P : 230 VAC<br>O/P : FULL LOAD                              | O.T.P. Active<br>Shut down o/p voltage, re-power on to recover   |
| 4  | SHORT PROTECTION            | SHORT EVERY OUTPUT<br>1 HOUR NO DAMAGE | I/P : 305 VAC<br>O/P : FULL LOAD<br>Ta : 25°C                 | NO DAMAGE<br>HICCUP  |

**COMPONENT STRESS TEST**

| NO | TEST ITEM  | SPECIFICATION            | TEST CONDITION   | RESULT                                       |
|----|--|--------------------------|--|--|
| 1  | Power Transistor<br>( D to S) or (C to E) Peak Voltage | Q 1 Rated :<br>10A/600V  | I/P : High-Line +3V = 308 V<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C                          | (1) 518 V<br>(2) 486 V<br>(3) 486 V          |
| 2  | Diode Peak Voltage                                     | D101 Rated :<br>20A/300V | I/P : High-Line +3V = 308 V<br>O/P : (1)Full Load Turn on<br>(2)Output Short<br>(3)Full load continue<br>Ta : 25°C                           | (1) 203 V<br>(2) 186 V<br>(3) 201 V          |
| 3  | Clamp Diode Peak Voltage                               | D2 Rated :<br>2A/800V    | I/P : High-Line +3V = 308 V<br>O/P : (1) Dynamic Load<br>90%Duty/1KHz<br>(2)Full load continue<br>Ta : 25°C                                  | (1) 628 V<br>(2) 632 V                       |
| 4  | Input Capacitor Voltage                                | C 5 Rated :<br>47u/450V  | I/P : High-Line +3V = 308 V<br>O/P : (1)Full Load Turn on /Off<br>(2) Min load Turn on /Off<br>(3)Full Load /Min load<br>Change<br>Ta : 25°C | (1) 430.31 V<br>(2) 432.70 V<br>(3) 432.80 V |
| 5  | Control IC Voltage Test                                | U1 Rated :<br>11V~30V    | I/P : High-Line +3V = 308 V<br>O/P : (1)Full Load Turn on /Off<br>(2) Min load Turn on /Off<br>(3)Full Load /Min load<br>Change<br>Ta : 25°C | (1) 21.380 V<br>(2) 21.389 V<br>(3) 21.410 V |
| 6  | Power Transistor<br>( D to S) or (C to E) Peak Voltage | Q3 Rated :<br>10A/700V   | I/P : High-Line +3V = 308 V<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C                          | (1) 696 V<br>(2) 608 V<br>(3) 696 V          |

■ SAFETY & E.M.C. TEST

**SAFETY TEST**

| NO | TEST ITEM            | SPECIFICATION  | TEST CONDITION   | RESULT  |
|----|----------------------|--|--|---|
| 1  | WITHSTAND VOLTAGE    | I/P-O/P : 3.75 KVAC/min<br>I/P-FG : 2 KVAC/min<4.5mA<br>O/P-FG : 1.5KVAC/min | I/P-O/P : 4 KVAC/min<br>I/P-FG : 2.4KVAC/min<br>O/P-FG : 1.8 KVAC/min<br>Ta : 25°C | I/P-O/P : 1.847 mA<br>I/P-FG : 2.324 mA<br>O/P-FG : 0.459 mA<br>NO DAMAGE |
| 2  | ISOLATION RESISTANCE | I/P-O/P : 500VDC>100MΩ<br>I/P-FG : 500VDC>100MΩ<br>O/P-FG : 500VDC>100MΩ     | I/P-O/P : 500 VDC<br>I/P-FG : 500 VDC<br>O/P-FG : 500 VDC<br>Ta : 25°C /70%RH      | I/P-O/P : 30 GΩ<br>I/P-FG : 21.5 GΩ<br>O/P-FG : 30 GΩ<br>NO DAMAGE        |
| 3  | GROUNDING CONTINUITY | FG(PE) TO CHASSIS<br>OR TRACE < 100 mΩ                                       | 40 A / 2min<br>Ta : 25°C / 70%RH   | 9 mΩ  |

**E.M.C TEST**

| NO | TEST ITEM  | SPECIFICATION                                      | TEST CONDITION  | RESULT                        |
|----|------------|--|---|-------------------------------|
| 1  | HARMONIC   | EN61000-3-2<br>CLASS A<br>CLASS C                  | I/P: 230VAC/50HZ<br>O/P:100/90/80/70/60%<br>ELECTRONICLOAD<br>O/P:100%LED LOAD<br>Ta:25°C | PASS                          |
| 2  | CONDUCTION | EN55022 EN55015<br>CLASS B                         | I/P: 230 VAC (50HZ)<br>O/P:FULL/60% LOAD<br>Ta:25°C                                       | PASS<br>Test by certified Lab |
| 3  | RADIATION  | EN55022 EN55015<br>CLASS B                         | I/P: 230 VAC (50HZ)<br>O/P:FULL LOAD<br>Ta:25°C   | PASS<br>Test by certified Lab |
| 4  | E.S.D      | EN61000-4-2<br>INDUSTRY<br>AIR:8KV / Contact:4KV   | I/P: 230 VAC/50HZ<br>O/P:FULL LOAD<br>Ta:25°C   | CRITERIA A                    |
| 5  | E.F.T      | EN61000-4-4<br>INDUSTRY<br>INPUT: 2KV              | I/P: 230 VAC/50HZ<br>O/P:FULL LOAD<br>Ta:25°C   | CRITERIA A                    |
| 6  | SURGE      | IEC61000-4-5<br>INDUSTRY<br>L-N :2KV<br>L,N-PE:4KV | I/P: 230 VAC/50HZ<br>O/P:FULL LOAD<br>Ta:25°C   | CRITERIA A                    |

■ RELIABILITY TEST

ENVIRONMENT TEST

| NO | TEST ITEM   | SPECIFICATION  | TEST CONDITION   | RESULT             |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
|----|---|--|--|--------------------|----------|-----------------------------|-------------------------|---|-----|--------|--------|---|-----|--------|--------|---|----|--------|--------|---|----|--------|--------|---|-----|--------|--------|---|----|--------|--------|---|----|--------|--------|---|----|--------|--------|---|------|--------|--------|----|----|--------|--------|----|----|--------|--------|----|-----|--------|--------|----|----|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|-------|--------|--------|----|------|--------|--------|--|
| 1  | TEMPERATURE RISE TEST   | MODEL : HLN-60H-24<br>1. ROOM AMBIENT BURN-IN : 1 HRS<br>I/P : 230VAC O/P : 95% LOAD Ta= 27.7 °C<br>2. HIGH AMBIENT BURN-IN : 2 HRS<br>I/P : 230VAC O/P : 95% LOAD Ta= 40 °C   | <table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT<br/>Ta= 27.7 °C</th> <th>HIGH AMBIENT<br/>Ta=40°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>BD1</td><td>65.2°C</td><td>77.5°C</td></tr> <tr><td>2</td><td>LF2</td><td>58.5°C</td><td>70.8°C</td></tr> <tr><td>3</td><td>L1</td><td>60.9°C</td><td>73.2°C</td></tr> <tr><td>4</td><td>L3</td><td>59.2°C</td><td>71.5°C</td></tr> <tr><td>5</td><td>C10</td><td>63.1°C</td><td>75.4°C</td></tr> <tr><td>6</td><td>Q1</td><td>67.3°C</td><td>79.6°C</td></tr> <tr><td>7</td><td>Q3</td><td>71.1°C</td><td>83.4°C</td></tr> <tr><td>8</td><td>U1</td><td>64.6°C</td><td>76.9°C</td></tr> <tr><td>9</td><td>RTH2</td><td>59.5°C</td><td>71.8°C</td></tr> <tr><td>10</td><td>D2</td><td>76.6°C</td><td>88.9°C</td></tr> <tr><td>11</td><td>C5</td><td>63.9°C</td><td>76.2°C</td></tr> <tr><td>12</td><td>C16</td><td>63.6°C</td><td>75.9°C</td></tr> <tr><td>13</td><td>T1</td><td>81.4°C</td><td>93.7°C</td></tr> <tr><td>14</td><td>D101</td><td>76.4°C</td><td>88.7°C</td></tr> <tr><td>15</td><td>C106</td><td>69.6°C</td><td>81.9°C</td></tr> <tr><td>16</td><td>C203</td><td>59.4°C</td><td>71.7°C</td></tr> <tr><td>17</td><td>LF100</td><td>60.2°C</td><td>72.5°C</td></tr> <tr><td>18</td><td>C111</td><td>59.6°C</td><td>71.9°C</td></tr> </tbody> </table> | NO                 | Position | ROOM AMBIENT<br>Ta= 27.7 °C | HIGH AMBIENT<br>Ta=40°C | 1 | BD1 | 65.2°C | 77.5°C | 2 | LF2 | 58.5°C | 70.8°C | 3 | L1 | 60.9°C | 73.2°C | 4 | L3 | 59.2°C | 71.5°C | 5 | C10 | 63.1°C | 75.4°C | 6 | Q1 | 67.3°C | 79.6°C | 7 | Q3 | 71.1°C | 83.4°C | 8 | U1 | 64.6°C | 76.9°C | 9 | RTH2 | 59.5°C | 71.8°C | 10 | D2 | 76.6°C | 88.9°C | 11 | C5 | 63.9°C | 76.2°C | 12 | C16 | 63.6°C | 75.9°C | 13 | T1 | 81.4°C | 93.7°C | 14 | D101 | 76.4°C | 88.7°C | 15 | C106 | 69.6°C | 81.9°C | 16 | C203 | 59.4°C | 71.7°C | 17 | LF100 | 60.2°C | 72.5°C | 18 | C111 | 59.6°C | 71.9°C |  |
| NO | Position  | ROOM AMBIENT<br>Ta= 27.7 °C  | HIGH AMBIENT<br>Ta=40°C  |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 1  | BD1   | 65.2°C   | 77.5°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 2  | LF2   | 58.5°C   | 70.8°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 3  | L1  | 60.9°C   | 73.2°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 4  | L3  | 59.2°C   | 71.5°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 5  | C10   | 63.1°C   | 75.4°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 6  | Q1  | 67.3°C   | 79.6°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 7  | Q3  | 71.1°C   | 83.4°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 8  | U1  | 64.6°C   | 76.9°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 9  | RTH2  | 59.5°C   | 71.8°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 10 | D2  | 76.6°C   | 88.9°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 11 | C5  | 63.9°C   | 76.2°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 12 | C16   | 63.6°C   | 75.9°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 13 | T1  | 81.4°C   | 93.7°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 14 | D101  | 76.4°C   | 88.7°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 15 | C106  | 69.6°C   | 81.9°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 16 | C203  | 59.4°C   | 71.7°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 17 | LF100   | 60.2°C   | 72.5°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 18 | C111  | 59.6°C   | 71.9°C   |                    |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 2  | LOW TEMPERATURE<br>TURN ON TEST                                   | TURN ON AFTER 2 HOUR   | I/P : 305VAC/100VAC<br>O/P : 95% LOAD<br>Ta= -40°C / -25   | TEST : OK          |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 3  | HIGH HUMIDITY<br>HIGH TEMPERATURE<br>HIGH VOLTAGE<br>TURN ON TEST | AFTER 12 HOURS<br>IN CHAMBER ON<br>CONTROL 40 °C<br>NO DAMAGE  | I/P : 305 VAC<br>O/P : 95% LOAD<br>Ta= 40 °C<br>HUMIDITY= 95 %R.H  | TEST : OK          |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 4  | TEMPERATURE<br>COEFFICIENT  | ± 0.03 % (0~40°C)  | I/P : 230 VAC<br>O/P : 95% LOAD  | ± 0.003 % (0~40°C) |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 5  | STORAGE TEMPERATURE TEST  | 1. Thermal shock Temperature : -45°C~ +90°C<br>2. Temperature change rate : 25°C / MIN<br>3. Dwell time low and high temperature : 30 MIN/EACH<br>4. Total test cycle : 5 CYCLE<br>5. Input/Output condition : STATIC  |  | OK                 |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |
| 6  | THERMAL SHOCK TEST  | 1. Thermal shock Temperature : -45°C~ +45°C<br>2. Temperature change rate : 25°C / MIN<br>3. Dwell time low and high temperature : 30 MIN/EACH<br>4. Total test cycle : 10 CYCLE<br>5. Input/Output condition : 230VAC/Full Load AC ON/OFF TEST<br>turn on 58sec ; turn off 2sec |  | OK                 |          |                             |                         |   |     |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |     |        |        |   |    |        |        |   |    |        |        |   |    |        |        |   |      |        |        |    |    |        |        |    |    |        |        |    |     |        |        |    |    |        |        |    |      |        |        |    |      |        |        |    |      |        |        |    |       |        |        |    |      |        |        |  |





# 60W Single Output Switching Power Supply

# HLN-60H series

|    |                             |  |  |
|----|-----------------------------|--|--|
| 7  | VIBRATION TEST              | 1 Carton & 1 Set<br>(1) Waveform : Sine Wave<br>(2) Frequency : 10-500Hz<br>(3) Sweep Time : 12min/sweep cycle<br>(4) Acceleration : 2G<br>(5) Test Time : 72min in each axis (X.Y.Z)<br>(6) Ta : 25°C   | TEST : OK  |
| 8  | CAPACITOR LIFE CYCLE        | HLN-60H-24 :SUPPOSE C106 IS THE MOST CRITICAL COMPONENT<br>(1) I/P : 230VAC O/P : FULL LOAD Ta=25 °C LIFE TIME<br>(2) I/P : 230VAC O/P : FULL LOAD Ta=40 °C LIFE TIME<br>(3) I/P : 230VAC O/P : 75% LOAD Ta= 40 °C LIFE TIME<br>(4) I/P : 230VAC O/P : 50% LOAD Ta=40 °C LIFE TIME | (1) 111468 HRS<br>(2) 39407 HRS<br>(3) 87395 HRS<br>(4) 141024 HRS |
| 9  | MTBF                        | MIL-HDBK-217F NOTICES2 PARTS COUNT<br>TOTAL FAILURE RATE : 338K HRS  |  |
| 10 | DMTBF/Accelerated Life Test | Demonstration Mean Time Between Failure(Expected Life) :<br>30,000 hours @ Tcase 70°C · 50,000 hours @ Tcase 60°C  |  |

| DATE     | SAMPLE         | TEST RESULT | TESTER     | APPROVAL      |
|----------|----------------|-------------|------------|---------------|
| 2011/5/3 | PRODUCT SAMPLE | PASS        | SANFORD SU | VINCENT TSENG |

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