



Test Report: ENC-120-12

120W Desktop Single Output Battery Charger

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Control Function Test
Component Stress Test

■ SAFETY & E.M.C. TEST

Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

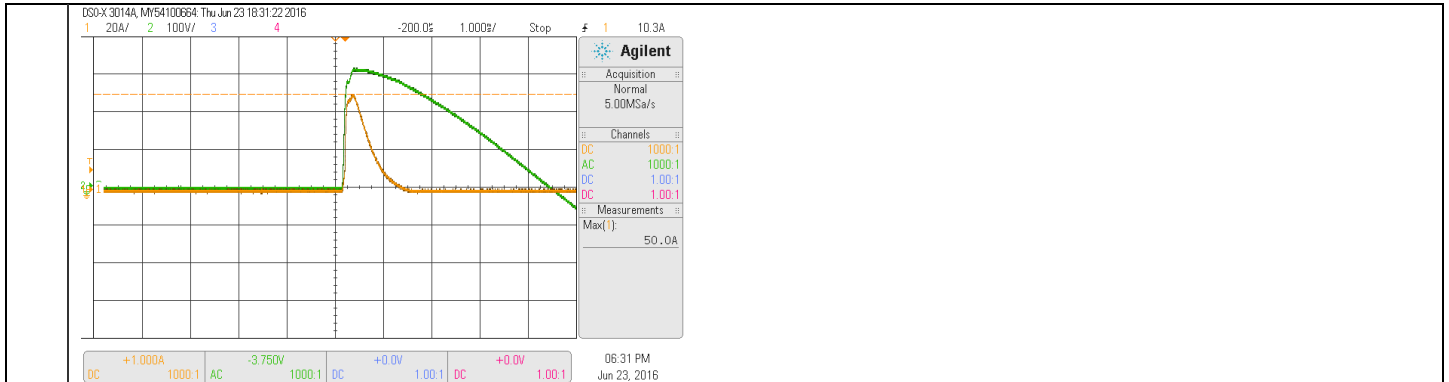
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|------------------------------------|---------------|--|---------|
| 1 | BOOST CHARGE VOLTAGE | 14.4V±0.2V | I/P: 230 VAC O/P:BAT. LOAD Ta:25°C | 14.43 V |
| 2 | FLOAT CHARGE VOLTAGE | 13.8V±0.2V | I/P: 230 VAC O/P:BAT. LOAD Ta:25°C | 13.83 V |
| 3 | OUTPUT CURRENT | 8A±0.4A | I/P: 230 VAC O/P:C.V MODE-2V Ta:25°C | 8.17A |
| 4 | LEAKAGE CURRENT FROM BATTERY (TYP) | <1mA | I/P: AC OFF O/P:BAT. LOAD Ta:25°C | 292 μA |

INPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|--|-----------------------|--------------------------------|---|---|
| 1 | INPUT VOLTAGE RANGE | 90VAC~264VAC | I/P:TESTING O/P:BAT. LOAD Ta:25°C | 65V~ 264 V |
| | | | I/P: LOW-LINE-3V=87 V HIGH-LINE+15%= 300 V O/P:BAT. LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE) | TEST: OK |
| 2 | INPUT FREQUENCY RANGE | 47HZ ~63 HZ NO DAMAGE | I/P: 100 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C | TEST: OK |
| 3 | LEAKAGE CURRENT | < 3.5 mA / 240VAC | I/P: 240 VAC O/P:Min LOAD Ta:25°C | L-FG: 0.64mA N-FG: 0.64mA |
| 4 | INPUT CURRENT (TYP) | 230 V/ 0.63 A 115 V/ 1.25 A | I/P: 230 VAC I/P: 115 VAC O/P:BAT. LOAD Ta:25°C | I = 0.576A/ 230VAC I = 1.15A/ 115VAC |
| 5 | POWER FACTOR (TYP) | 0.95/ 230 VAC 0.98/ 115 VAC | I/P: 230 VAC I/P: 115 VAC O/P:BAT. LOAD Ta:25°C | PF=0.973 / 230VAC PF= 0.994/ 115VAC |
| 6 | EFFICIENCY (TYP) | 89% | I/P: 230 VAC O/P:BAT. LOAD Ta:25°C | 89.02% |
| 7 | INRUSH CURRENT (TYP) | 230 V/ 65 A COLD START | I/P: 230 VAC O/P:BAT. LOAD Ta:25°C | I =50A/230VAC T50=480 us/230V |
| INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH1: Input current | | | | |

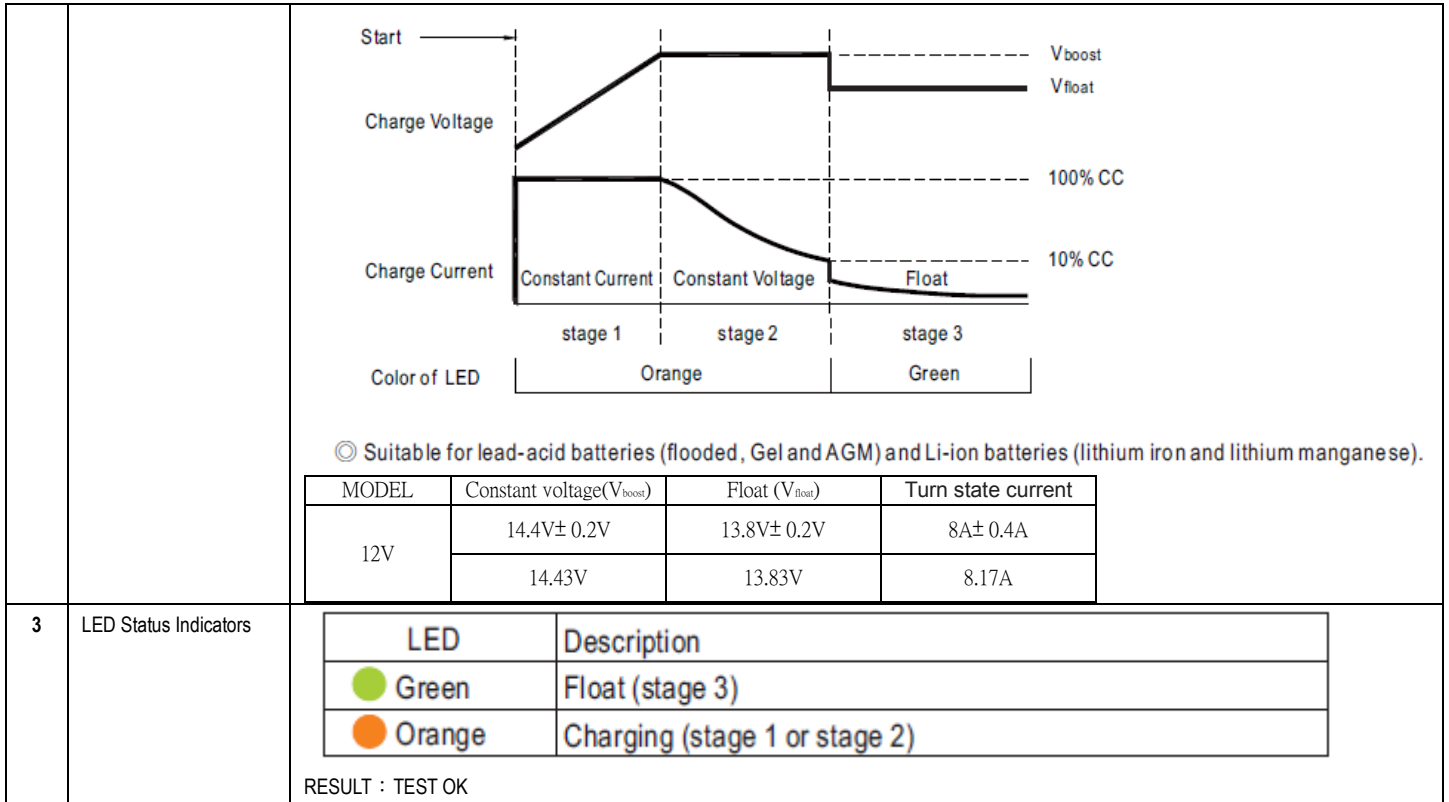


PROTECTION FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|-----------------------------|--|---|--|
| 1 | OVER VOLTAGE PROTECTION | CH1:15.5~18.2V PROTECTION TYPE : Shut down and latch off o/p voltage, re-power on to recover | I/P: 264 VAC I/P: 90 VAC O/P:TESTING Ta:25°C | 15.9 V/230VAC 15.89V/ 90VAC PROTECTION TYPE : Shut down and latch off o/p voltage, re-power on to recover |
| 2 | OVER TEMPERATURE PROTECTION | SPEC: NO DAMAGE PROTECTION TYPE : Shut down O/P voltage, recovers automatically after temperature goes down | I/P: 264 VAC I/P: 90 VAC O/P:BAT. LOAD | O.T.P. Active PROTECTION TYPE : Shut down O/P voltage, recovers automatically after temperature goes down |
| 3 | SHORT PROTECTION | SHORT EVERY OUTPUT 1 HOUR NO DAMAGE PROTECTION TYPE : Shut down O/P voltage, re-power on to recover | I/P: 264 VAC O/P: NO LOAD Ta:25°C | NO DAMAGE PROTECTION TYPE : Shut down O/P voltage, re-power on to recover |
| 4 | BATTERY REVERSE POLARITY | By internal fuse. | I/P: 230 VAC O/P:BAT. LOAD Ta:25°C | Fuse open |

CONTROL FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | |
|-------|--------------------------|--------------------------------|----------------|------------|--|
| 1 | TEMPERATURE COMPENSATION | Constant voltage point(V) | | | |
| | | Ta=0°C | Ta=25°C | Ta=50°C | I/P: 230 VAC O/P:NO . LOAD Ta:25°C |
| | | 14.85±0.2V | 14.4±0.2V | 13.95±0.2V | |
| 14.9V | 14.471V | 14.015V | | | |
| 2 | Charging curve | I/P:230Vac O/P:TESTING Ta:25°C | | | |



COMPONENT STRESS TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|---|-----------------------|--|--|
| 1 | Power Transistor (D to S) or (C to E) Peak Voltage | Q 2 Rated 12A/800V | I/P:High-Line +3V = 267 V AC ON/OFF VDS : O/P: (1)CV=13.8V (2)OUTPUT SHORT (3)CV=13.8V continue I/P:High-Line +3V = 97 V AC ON/OFF VDS : O/P: (1)CV=13.8V (2)OUTPUT SHORT (3)CV=13.8V continue Ta:25°C | VDS : (1) 650V (2) 392V (3) 650V VDS : (1) 510V (2) 261V (3) 502V |
| 2 | P.F.C Transistor (D to S) or (C to E) Peak Voltage | Q 1 Rated 20A/600V | I/P:High-Line +3V = 267 V AC ON/OFF VDS : O/P: (1)CV=13.8V (2)OUTPUT SHORT (3)CV=13.8V continue I/P:High-Line +3V = 97 V AC ON/OFF VDS : O/P: (1)CV=13.8V (2)OUTPUT SHORT (3)CV=13.8V continue Ta:25°C | VDS : (1) 425V (2) 377V (3) 433V VDS : (1) 305V (2) 134V (3) 319V |

| | | | | |
|---|--------------------------|----------------------------------|--|-----------------------------------|
| 3 | P.F.C DIODE | D5 Rated 8A/600 V | I/P:High-Line +3V =267 V AC ON/OFF O/P: (1)CV=13.8V (2)OUTPUT SHORT (3)CV=13.8V continue Ta:25°C | (1) 389V (2) 4.7V (3) 401V |
| 4 | Diode Peak Voltage | Q 101 Rated 75V80A | I/P:High-Line +3V = 267 V AC ON/OFF O/P: (1)CV=13.8V (2)OUTPUT SHORT (3)CV=13.8V continue Ta:25°C | (1)46.9 V (2) 0 V (3) 46.9V |
| 5 | Clamp Diode Peak Voltage | D30 Rated 800V /2 A | I/P:High-Line +3V = 267 V O/P: (1)BAT. LOAD (2)Output Short (3)CV=13.8V continue Ta:25°C | (1) 563V (2)4V (3)563V |
| 6 | Input Capacitor Voltage | C 5 Rated 100 μ 400V105°C | I/P:High-Line +3V =267 V O/P: (1)CV=13.8V (2)OUTPUT SHORT (3)CV=13.8V continue Ta:25°C | (1)398V (2) 390V (3)398V |
| 7 | Control IC Voltage Test | PWM IC U1 Rate 10V~28V | I/P:High-Line +3V =267 V O/P: (1)CV=13.8V (2)OUTPUT SHORT (3)CV=13.8V continue Ta:25°C | (1)20.7V (2)14.8V (3)21V |

SAFETY & E.M.C. TEST

SAFETY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|----------------------|---|--|--|
| 1 | WITHSTAND VOLTAGE | EN 60950-1 I/P-O/P: 3 KVAC/min I/P-FG:2 KVAC/min O/P-FG:0.5KVAC/min | I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG: 0.6 KVAC/min Ta:25°C | I/P-O/P: 5.56 mA I/P-FG: 4.85 mA O/P-FG: 4.08mA NO DAMAGE |
| 2 | ISOLATION RESISTANCE | I/P-O/P:500VDC>100M Ω I/P-FG: 500VDC>100M Ω O/P-FG:500VDC>100M Ω | I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C | I/P-O/P:13.3G Ω I/P-FG: 5.13G Ω O/P-FG:21.6G Ω NO DAMAGE |
| 3 | GROUNDING CONTINUITY | EN 60950-1 FG(PE) TO CHASSIS OR TRACE < 100 m Ω | 40A / 2min Ta:25°C | 21m Ω |

E.M.C TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|------------|------------------------|---|-------------------------------|
| 1 | HARMONIC | EN61000-3-2 CLASS A | I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C | PASS |
| 2 | CONDUCTION | EN55022 CLASS B | I/P: 230 VAC (50HZ) O/P:FULL Ta:25°C | PASS Test by certified Lab |

| | | | | |
|---|-----------|--|---|-------------------------------|
| 3 | RADIATION | EN55022 CLASS B | I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C | PASS Test by certified Lab |
| 4 | E.S.D | EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV | I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C | CRITERIA A |
| 5 | E.F.T | EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV | I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C | CRITERIA A |
| 6 | SURGE | IEC61000-4-5 LIGHT INDUSTRY L-N :1KV L,N-PE:2KV | I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C | CRITERIA A |

RELIABILITY TEST

ENVIRONMENT TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|---------------------------------|--|--|---|----|----------|--------------------------|--------------------------|---|-----|--------|--------|---|-----|--------|--------|---|-----|--------|--------|---|----|--------|--------|---|----|--------|--------|---|----|--------|---------|---|----|--------|---------|---|----|--------|---------|---|----|--------|--------|----|----|--------|--------|----|-----|---------|---------|----|----|--------|---------|----|-----|--------|--------|----|------|--------|---------|----|------|--------|--------|----|-------|--------|--------|----|-----|--------|--------|----|------|--------|--------|
| 1 | TEMPERATURE RISE TEST | MODEL : ENC-120-12 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 230VAC O/P : FULL LOAD Ta= 32.5 °C 2. HIGH AMBIENT BURN-IN : 1 HRS I/P : 230VAC O/P : FULL LOAD Ta= 49.2 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | <table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 32.5 °C</th> <th>HIGH AMBIENT Ta= 49.2 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>54.7°C</td><td>70.3°C</td></tr> <tr><td>2</td><td>ZR1</td><td>54.0°C</td><td>69.0°C</td></tr> <tr><td>3</td><td>BD1</td><td>70.2°C</td><td>85.6°C</td></tr> <tr><td>4</td><td>L1</td><td>59.5°C</td><td>75.6°C</td></tr> <tr><td>5</td><td>L2</td><td>62.8°C</td><td>78.8°C</td></tr> <tr><td>6</td><td>Q1</td><td>87.2°C</td><td>107.2°C</td></tr> <tr><td>7</td><td>Q2</td><td>87.0°C</td><td>106.9°C</td></tr> <tr><td>8</td><td>D5</td><td>85.3°C</td><td>104.9°C</td></tr> <tr><td>9</td><td>C5</td><td>65.9°C</td><td>82.2°C</td></tr> <tr><td>10</td><td>U1</td><td>60.0°C</td><td>76.5°C</td></tr> <tr><td>11</td><td>D30</td><td>105.3°C</td><td>125.7°C</td></tr> <tr><td>12</td><td>T1</td><td>92.5°C</td><td>111.0°C</td></tr> <tr><td>13</td><td>C52</td><td>83.4°C</td><td>96.4°C</td></tr> <tr><td>14</td><td>Q100</td><td>82.8°C</td><td>100.2°C</td></tr> <tr><td>15</td><td>C108</td><td>77.8°C</td><td>94.7°C</td></tr> <tr><td>16</td><td>LF100</td><td>67.8°C</td><td>84.6°C</td></tr> <tr><td>17</td><td>RT1</td><td>67.8°C</td><td>83.9°C</td></tr> <tr><td>18</td><td>TSW1</td><td>79.2°C</td><td>97.7°C</td></tr> </tbody> </table> | NO | Position | ROOM AMBIENT Ta= 32.5 °C | HIGH AMBIENT Ta= 49.2 °C | 1 | LF1 | 54.7°C | 70.3°C | 2 | ZR1 | 54.0°C | 69.0°C | 3 | BD1 | 70.2°C | 85.6°C | 4 | L1 | 59.5°C | 75.6°C | 5 | L2 | 62.8°C | 78.8°C | 6 | Q1 | 87.2°C | 107.2°C | 7 | Q2 | 87.0°C | 106.9°C | 8 | D5 | 85.3°C | 104.9°C | 9 | C5 | 65.9°C | 82.2°C | 10 | U1 | 60.0°C | 76.5°C | 11 | D30 | 105.3°C | 125.7°C | 12 | T1 | 92.5°C | 111.0°C | 13 | C52 | 83.4°C | 96.4°C | 14 | Q100 | 82.8°C | 100.2°C | 15 | C108 | 77.8°C | 94.7°C | 16 | LF100 | 67.8°C | 84.6°C | 17 | RT1 | 67.8°C | 83.9°C | 18 | TSW1 | 79.2°C | 97.7°C |
| NO | Position | ROOM AMBIENT Ta= 32.5 °C | HIGH AMBIENT Ta= 49.2 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | LF1 | 54.7°C | 70.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | ZR1 | 54.0°C | 69.0°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | BD1 | 70.2°C | 85.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | L1 | 59.5°C | 75.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | L2 | 62.8°C | 78.8°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Q1 | 87.2°C | 107.2°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Q2 | 87.0°C | 106.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | D5 | 85.3°C | 104.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | C5 | 65.9°C | 82.2°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | U1 | 60.0°C | 76.5°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | D30 | 105.3°C | 125.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | T1 | 92.5°C | 111.0°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | C52 | 83.4°C | 96.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Q100 | 82.8°C | 100.2°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | C108 | 77.8°C | 94.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | LF100 | 67.8°C | 84.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | RT1 | 67.8°C | 83.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | TSW1 | 79.2°C | 97.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | LOW TEMPERATURE TURN ON TEST | TURN ON AFTER 2 HOUR | I/P : 264VAC/100VAC O/P : 100 % LOAD Ta= -35°C | TEST : OK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



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|----|---|---|--|--|
| 3 | HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST | AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE | I/P : 272 VAC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H | TEST : OK |
| 4 | TEMPERATURE COEFFICIENT | ± 0.05 %/°C (0~50°C) | I/P : 230 VAC O/P : FULL LOAD | ± 0 %/°C (0~50°C) |
| 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 |
| 6 | THERMAL SHOCK TEST | 1. Thermal shock Temperature : -35°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 |
| 7 | VIBRATION TEST | 1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 3G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C | | TEST : OK |
| 8 | CAPACITOR LIFE CYCLE | SUPPOSE C108 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) 146404HRS (2) 22040HRS (3) 64321HRS (4) 143471HRS |
| 9 | MTBF | Conducted by Parts Stress Analysis Prediction 1726.4K hrs min. Telcordia SR-332 (Bellcore) ; 206.1K hrs min. MIL-HDBK-217F (25°C) | | |
| 10 | DMTBF/Accelerated Life Test | Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50°C | | |

| TEST RESULT | TESTER | REVIEW | APPROVAL |
|-------------|------------|------------|--------------|
| PASS | DANIEL GAO | SANFORD SU | VINCENT ZENG |

12.10.30 A50-F031