



Test Report: LRS-100-24

100W 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

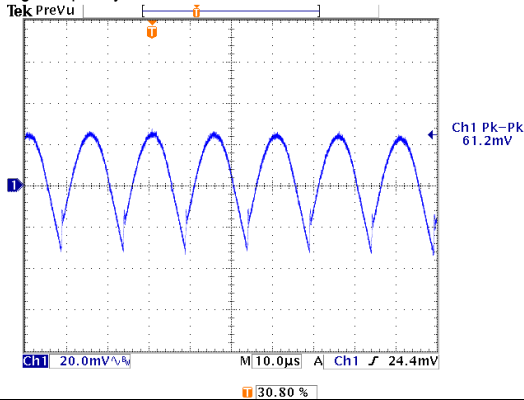
ENVIRONMENT TEST

DESIGN VERIFY TEST

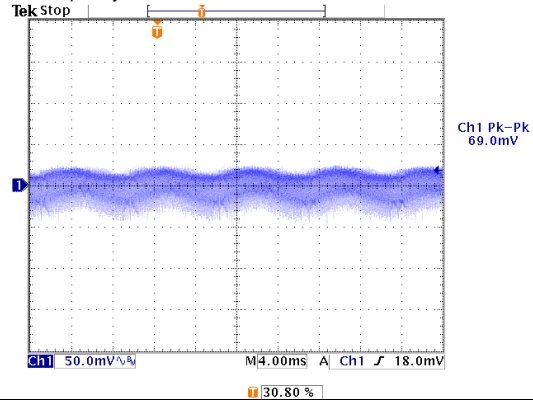
OUTPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|-------------------------------|---------------------|---|--|
| 1 | OUTPUT VOLTAGE ADJUST RANGE | CH1: 21.6 V~ 28.8 V | I/P: 230 VAC I/P: 115 VAC O/P: MIN LOAD Ta: 25°C | 20.183V~30.181V/230VAC 20.179V~30.183V/115VAC |
| 2 | OUTPUT VOLTAGE(Max) TOLERANCE | V1: -1%~ 1% | I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C | V1: -0.021%~ 0.021% |
| 3 | LINE REGULATION (Max) | V1: -0.5%~ 0.5% | I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C | V1: -0.021%~0.021% |
| 4 | LOAD REGULATION(Max) | V1: -0.5%~0.5% | I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C | V1:- 0.021%~ 0.02 1% |
| 5 | OVER/UNDERSHOOT TEST | < ±5% | I/P: 230VAC O/P:FULL LOAD Ta:25°C | <5% |
| 6 | RIPPLE & NOISE(Max) | V1: 150 mVp-p | I/P:230VAC O/P:FULL LOAD Ta:25°C | V1: 69mVp-p |

high frequency :



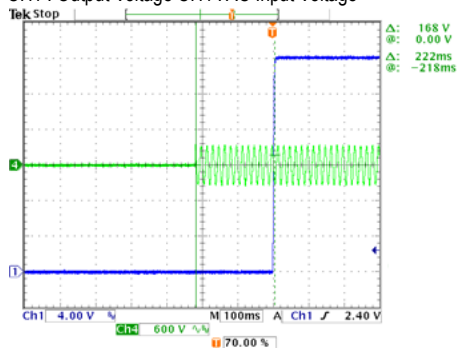
low frequency :



| | | | | |
|---|------------------|-------------------------------|--|--------------------------------|
| 7 | SET UP TIME(Max) | 230VAC/500ms 115VAC/ 500ms | I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C | 230VAC/ 222ms 115VAC/ 222ms |
|---|------------------|-------------------------------|--|--------------------------------|

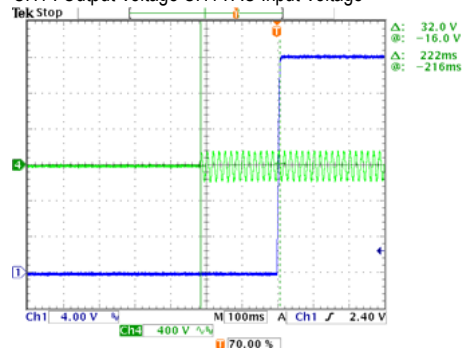
INPUT=230VAC/50HZ @ FULL LOAD

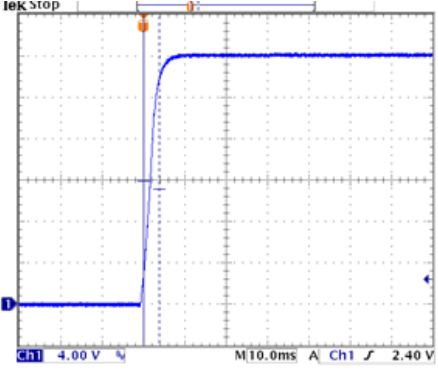
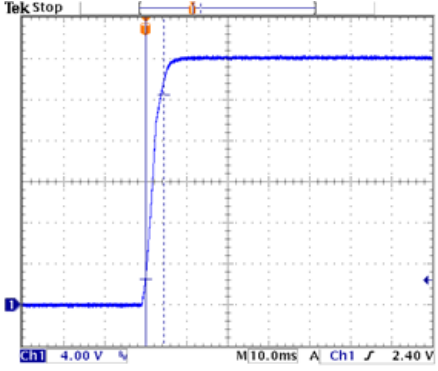
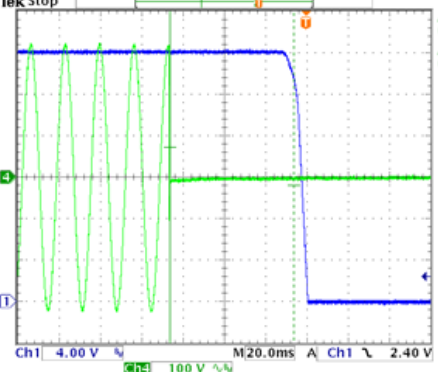
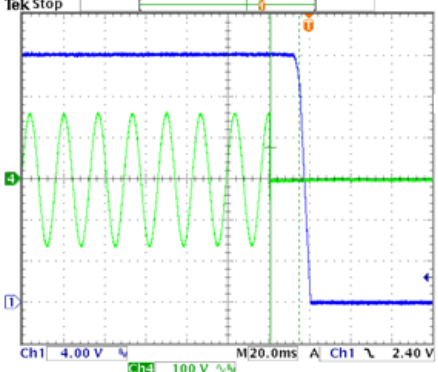
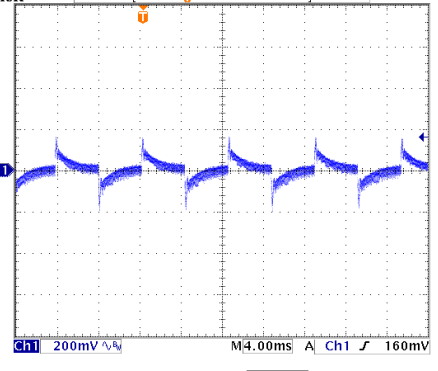
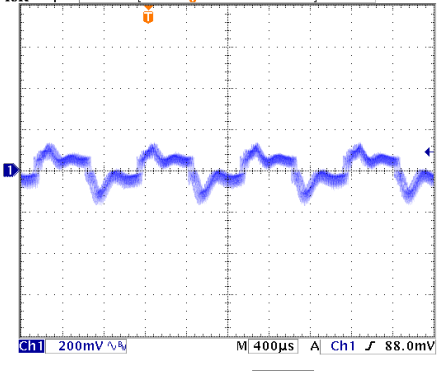
CH1 : Output Voltage CH4 : AC Input Voltage



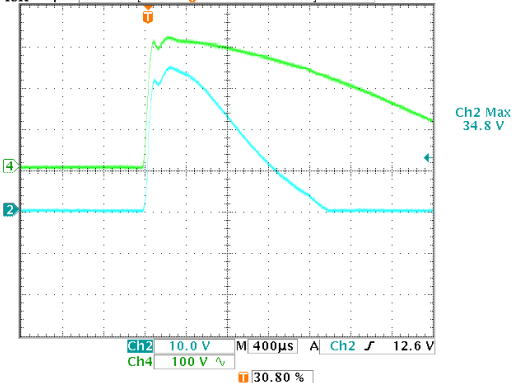
INPUT=115VAC/60HZ @ FULL LOAD

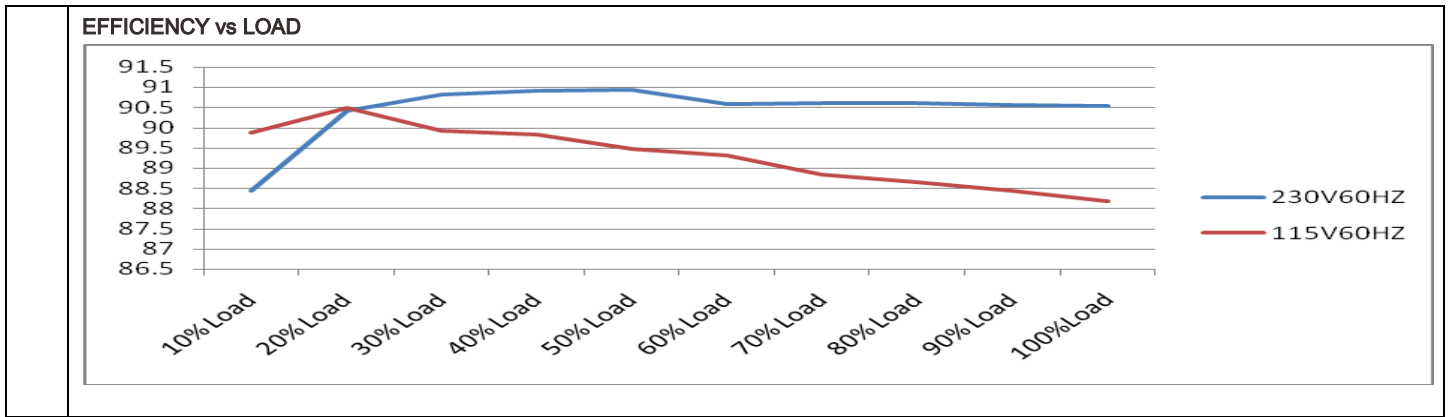
CH1 : Output Voltage CH4 : AC Input Voltage



| | | | |
|--|--------------------------------------|---|---|
| <p>8</p> <p>RISE TIME (Max)</p> | <p>230VAC/ 30ms 115VAC/ 30ms</p> | <p>I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C</p> | <p>230VAC/ 3.80ms 115VAC/4.40ms</p> |
| <p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p>  | | <p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p>  | |
| <p>9</p> <p>HOLD UP TIME(Typ)</p> | <p>230VAC/ 55ms 115VAC/ 10ms</p> | <p>I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C</p> | <p>230VAC/60.0ms 115VAC/14.0ms</p> |
| <p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage</p>  | | <p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage</p>  | |
| <p>10</p> <p>DYNAMIC LOAD</p> | <p>V1: 2400 mVp-p</p> | <p>I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C</p> | <p>360mVp-p 300mVp-p</p> |
| <p>FULL /50% LOAD 50%DUTY / 120HZ</p>  | | <p>FULL /50% LOAD 50%DUTY / 1KHZ</p>  | |

INPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|--|-----------------------|-------------------------------|--|--------------------------------------|
| 1 | INPUT VOLTAGE RANGE | 85VAC~264VAC 120VDC~373VDC | I/P:TESTING O/P:FULL LOAD Ta:25°C | 73V~264V 110VDC~373VDC |
| | | | I/P: (1)LOW-LINE-3V=82V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD ON: 30 Sec OFF: 30 Sec 10MIN (2)230Vac ON: 0.5 Sec OFF: 0.5 Sec 20MIN (3)230Vac ON:3Sec OFF:3Sec 12HOURS (POWER ON/OFF NO DAMAGE) | TEST:OK |
| 2 | INPUT FREQUENCY RANGE | 47HZ ~63 HZ NO DAMAGE | I/P:170 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C | TEST: OK |
| 3 | INPUT CURRENT (Typ) | 230V/ 1.2A 115V/ 1.9A | I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C | I =1.08A/ 230VAC I =1.83A/ 115VAC |
| 4 | LEAKAGE CURRENT | < 0.75 mA / 240 VAC | I/P: 240 VAC O/P: Min LOAD Ta: 25°C | L-FG: 0.324 mA N-FG: 0.324 mA |
| 5 | NO LOAD CONSUMPTION | < 0.3 W | I/P: 115VAC I/P: 230VAC O/P: NO LOAD Ta: 25°C | < 0.1236 W < 0.2395 W |
| 6 | INRUSH CURRENT(Typ) | 230V/50A COLD START | I/P: 230 VAC O/P: FULL LOAD Ta: 25°C | I =34.8A/ 230VAC |
| <p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH2 : Input current (1V=1A) CH4 : AC Input Voltage</p>  <p>Ch2 Max 34.8 V</p> <p>Ch2 10.0 V M 400µs A Ch2 12.6 V</p> <p>Ch4 100 V V</p> <p>30.80%</p> | | | | |
| 7 | EFFICIENCY(Typ) | 90% | I/P:230 VAC O/P:FULL LOAD Ta:25°C | 90.54% |



PROTECTION FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|-------------------------|--|--|---|
| 1 | OVER LOAD PROTECTION | 110%~ 150% | I/P: 230VAC I/P: 115VAC O/P: TESTING Ta:25°C | 127.33%/ 230VAC 125.78%/115VAC Hiccup Mode |
| 2 | OVER VOLTAGE PROTECTION | CH:28.8V~33.6V | I/P: 230VAC I/P: 115VAC O/P: MIN LOAD Ta:25°C | 32.5V/ 230VAC 32.1V/115VAC Shut down Re- power ON |
| 3 | SHORT PROTECTION | SHORT EVERY OUTPUT 1 HOUR NO DAMAGE | I/P: 264VAC O/P: FULL LOAD Ta:25°C | NO DAMAGE Hiccup Mode |

COMPONENT STRESS TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|---|--|--|---|
| 1 | PWM Transistor (D to S) or (C to E) Peak Voltage | Q1 Rated 11A/ 600 V | I/P:High-Line +3V =267V AC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. Ta:25°C | (1)562V (2)570V (3)582V (4)562V (5)562V (6)574V (7)582V (1)346V (2)327V (3)354V (4)346V (5)350V (7)346V |
| 2 | Diode Peak Voltage | Q101 Rated : 20A/150 V | I/P:High-Line +3V =267 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD Ta:25°C | Q101: (1)133V (2)146V (3)135V (4)135V (5)134V (6)134V (7)144V (8)133V |
| 3 | Input Capacitor Voltage | C5 Rated: 150 μ /400V 105°C | I/P:High-Line +3V =267 V O/P: (1)Full Load input on/off (2) Min load input on /Off (3)Full Load /Min load Change Ta:25°C | (1)363V (2)363V (3)364V |
| 4 | Control IC Voltage Test | PWM IC U1 Rated :28 V(MAX) 9.5V(MIN. | I/P:High-Line +3V =267 V AC ON/OFF O/P:(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VR Min . LOW LINE Ta:25°C | (1) 21.5V (2) 12.9V (3) 21.2V (4) 26.5V (5) 16.5V |
| 5 | Clamp Diode Peak Voltage | D 5 Rated: 800 V 2 A | I/P: High-Line +3V = 267 V AC ON/OFF O/P: (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta: 25°C | (1)474V (2)462V |

SAFETY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|----------------------|---|--|--|
| 1 | WITHSTAND VOLTAGE | I/P-O/P: 4KVAC/min I/P-FG :2KVAC/min O/P-FG:1.25KVAC/min | I/P-O/P: 4.4KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.5 KVAC/min Ta:25°C | I/P-O/P:2.457mA I/P-FG:2.165mA O/P-FG:1.776mA NO DAMAGE |
| 2 | ISOLATION RESISTANCE | I/P-O/P:500VDC>100MΩ I/P-FG: 500VDC>100MΩ O/P-FG:500VDC>100MΩ | I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C | I/P-O/P: 9999MΩ I/P-FG: 9999MΩ O/P-FG: 9999MΩ NO DAMAGE |
| 3 | GROUNDING CONTINUITY | FG(PE) TO CHASSIS OR TRACE < 100 mΩ | 40A / 2min Ta:25°C | 4mΩ |

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/50% LOAD Ta: 25°C | PASS Test by certified Lab |
| 3 | RADIATION | EN55022 CLASS B | I/P: 230 VAC (50HZ) O/P: FULL LOAD Ta: 25°C | PASS Test by certified Lab |
| 4 | E.S.D | EN61000-4-2 INDUSTRY AIR: 8KV / Contact: 4KV | I/P: 230 VAC/50HZ O/P: FULL LOAD Ta: 25°C | CRITERIA A |
| 5 | E.F.T | EN61000-4-4 INDUSTRY INPUT: 2KV | I/P: 230 VAC/50HZ O/P: FULL LOAD Ta: 25°C | CRITERIA A |
| 6 | SURGE | IEC61000-4-5 INDUSTRY L-N : 2KV L,N-PE: 4KV | I/P: 230 VAC/50HZ O/P: FULL LOAD Ta: 25°C | CRITERIA A |
| 7 | Test by certified Lab & Test Report Prepare | | | |

RELIABILITY TEST

ENVIRONMENT TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|---|---|--|---|----|----------|--------------------------|-------------------------|---|-----------|--------|--------|---|------------|--------|--------|---|------------|--------|--------|---|------------|--------|--------|---|-----------|--------|--------|---|-----------|--------|--------|---|-----------|--------|--------|---|------------|--------|--------|---|------------|--------|--------|----|---------------|--------|--------|----|---------------|--------|--------|----|-------------|--------|--------|----|-------------|--------|--------|----|-------------|--------|--------|
| 1 | TEMPERATURE RISE TEST | MODEL: LRS-100-24 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=18.6°C 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=51.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | <table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 18.6 °C</th> <th>HIGH AMBIENT Ta=51.9 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>U1</td><td>46.2°C</td><td>79.1°C</td></tr> <tr><td>2</td><td>D30</td><td>48.2°C</td><td>81.1°C</td></tr> <tr><td>3</td><td>LF1</td><td>44.3°C</td><td>78.5°C</td></tr> <tr><td>4</td><td>BD1</td><td>51.1°C</td><td>83.7°C</td></tr> <tr><td>5</td><td>C5</td><td>42.7°C</td><td>74.2°C</td></tr> <tr><td>6</td><td>D5</td><td>52.2°C</td><td>86.6°C</td></tr> <tr><td>7</td><td>Q1</td><td>51.6°C</td><td>86.6°C</td></tr> <tr><td>8</td><td>R15</td><td>51.7°C</td><td>86.1°C</td></tr> <tr><td>9</td><td>C35</td><td>43.0°C</td><td>76.2°C</td></tr> <tr><td>10</td><td>T1coil</td><td>56.3°C</td><td>89.4°C</td></tr> <tr><td>11</td><td>T1coil</td><td>60.9°C</td><td>93.7°C</td></tr> <tr><td>12</td><td>C105</td><td>46.1°C</td><td>78.9°C</td></tr> <tr><td>13</td><td>Q101</td><td>62.5°C</td><td>94.6°C</td></tr> <tr><td>14</td><td>L100</td><td>39.0°C</td><td>72.1°C</td></tr> </tbody> </table> | NO | Position | ROOM AMBIENT Ta= 18.6 °C | HIGH AMBIENT Ta=51.9 °C | 1 | U1 | 46.2°C | 79.1°C | 2 | D30 | 48.2°C | 81.1°C | 3 | LF1 | 44.3°C | 78.5°C | 4 | BD1 | 51.1°C | 83.7°C | 5 | C5 | 42.7°C | 74.2°C | 6 | D5 | 52.2°C | 86.6°C | 7 | Q1 | 51.6°C | 86.6°C | 8 | R15 | 51.7°C | 86.1°C | 9 | C35 | 43.0°C | 76.2°C | 10 | T1coil | 56.3°C | 89.4°C | 11 | T1coil | 60.9°C | 93.7°C | 12 | C105 | 46.1°C | 78.9°C | 13 | Q101 | 62.5°C | 94.6°C | 14 | L100 | 39.0°C | 72.1°C |
| NO | Position | ROOM AMBIENT Ta= 18.6 °C | HIGH AMBIENT Ta=51.9 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | U1 | 46.2°C | 79.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | D30 | 48.2°C | 81.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | LF1 | 44.3°C | 78.5°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | BD1 | 51.1°C | 83.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | C5 | 42.7°C | 74.2°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | D5 | 52.2°C | 86.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Q1 | 51.6°C | 86.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | R15 | 51.7°C | 86.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | C35 | 43.0°C | 76.2°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | T1coil | 56.3°C | 89.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | T1coil | 60.9°C | 93.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | C105 | 46.1°C | 78.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Q101 | 62.5°C | 94.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | L100 | 39.0°C | 72.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | OVER LOAD BURN-IN TEST | NO DAMAGE 1 HOUR (MIN) | I/P: 230 VAC O/P: 124 %LOAD Ta: 25°C | TEST: OK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | LOW TEMPERATURE TURN ON TEST | TURN ON AFTER 2 HOUR | I/P: 264VAC/100VAC O/P: 100 %LOAD Ta= -30 °C | TEST: OK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | TEMPERATURE COEFFICIENT | ± 0.03 %/°C (0~50°C) | I/P: 230 VAC O/P: FULL LOAD | 0.008%/°C (0~40°C) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | STORAGE TEMPERATURE TEST | 1. Thermal shock Temperature : -40°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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | THERMAL SHOCK TEST | 1. Thermal shock Temperature : -30°C~ 70°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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



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|----|-----------------------------|--|---|
| 8 | VIBRATION TEST | 1 Carton & 1 Set (1) Waveform: Sine Wave (2) Frequency: 10~500Hz (3) Sweep Time: 10min/sweep cycle (4) Acceleration: 5G (5) Test Time: 60min in each axis (X.Y.Z) (6) Ta: 25°C | TEST: OK |
| 9 | CAPACITOR LIFE CYCLE | 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 (4) I/P: 230VAC O/P: 50% LOAD Ta= 50 °C LIFE TIME | (1) 396481HRS (2) 72523HRS (3) 104095HRS (4) 156612HRS |
| 10 | MTBF | 3348.9K hrs min. Telcordia SR-332 (Bellcore) ; 677.4Khrs min. MIL-HDBK-217F (25°C) | |
| 11 | DMTBF/Accelerated Life Test | Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50°C | |

| TEST RESULT | TESTER | APPROVAL |
|-------------|--------|----------|
| PASS | FRANK | WANGDZ |

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