



Test Report: LRS-150F-12

150W 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

| N O | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|-------------------------------|------------------------------|--|--|
| 1 | OUTPUT VOLTAGE ADJUST RANGE | CH1: 10.2V- 13.8 V | I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C | 9.77V-14.26V/230VAC 9.77V-14.26V/115VAC |
| 2 | OUTPUT VOLTAGE(Max) TOLERANCE | V1: 1 %~ -1 % | I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C | V1: 0%~-0.08% |
| 3 | LINE REGULATION (Max) | V1: 0.5 %~ -0.5 % | I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C | V1: 0%-0% |
| 4 | LOAD REGULATION(Max) | V1: 0.5 %~ -0.5 % | I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C | V1: 0%~-0.08% |
| 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: 27.7mVp-p |
| <div style="display: flex; justify-content: space-around;"> <div style="width: 45%;"> <p>high frequency :</p> </div> <div style="width: 45%;"> <p>low frequency :</p> </div> </div> | | | | |
| 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/230ms 115VAC/202ms |
| INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage | | | INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage | |



150W Single Output Switching Power Supply

LRS-150F series

| | | | |
|---|------------------------------------|--|--|
| <p>Tek Stop</p> <p>Ch1: 2.00 V, Ch2: 600 V, M: 100ms, A: Ch1, 1.20 V</p> <p>70.00 %</p> <p>Δ: 144 V @: 12.0 V Δ: 230ms @: -224ms</p> | | <p>Tek 執行</p> <p>Ch1: 2.00 V, Ch2: 500 V, M: 100ms, A: Ch1, 10.3 V</p> <p>60.80 %</p> <p>Δ: 11.6 V @: 11.7 V Δ: 202ms @: 2.00ms</p> | |
| <p>8 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/6ms 115VAC/8.2ms</p> |
| <p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p> <p>Tek Run</p> <p>Ch1: 2.00 V, M: 10.0ms, A: Ch1, 1.20 V</p> <p>30.00 %</p> <p>Δ: 720mV @: 6.04 V Δ: 6.00ms @: 0.00 s</p> | | <p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p> <p>Tek Run</p> <p>Ch1: 2.00 V, M: 10.0ms, A: Ch1, 1.20 V</p> <p>30.00 %</p> <p>Δ: 8.12 V @: 1.28 V Δ: 8.20ms @: 0.00 s</p> | |
| <p>9 HOLD UP TIME (Typ.)</p> | <p>230VAC/16ms 115VAC/12ms</p> | <p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p> | <p>230VAC/82.4ms 115VAC/16.8ms</p> |
| <p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> | | <p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> | |



150W Single Output Switching Power Supply

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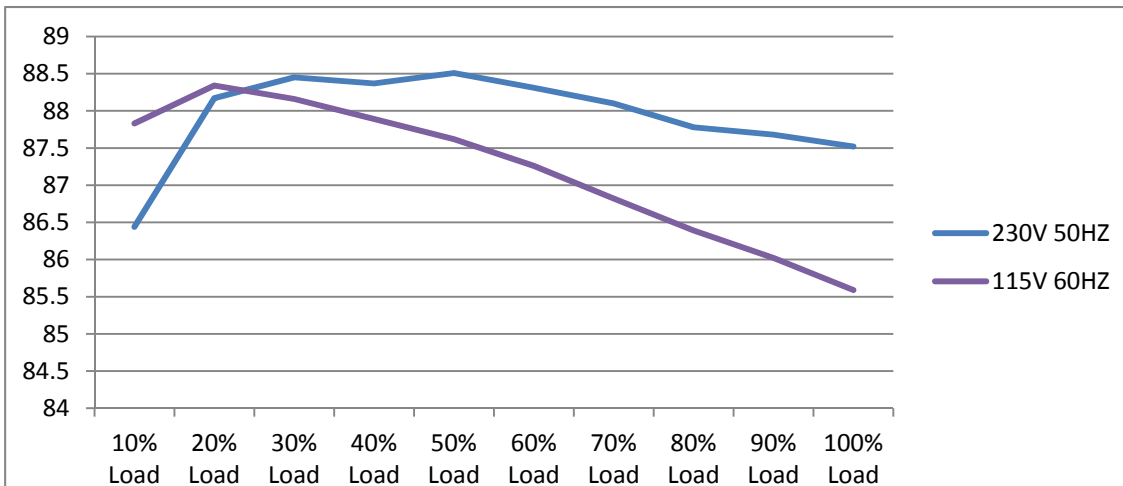
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|----|---|---|--------------------------------------|---|
| | | <p>Trig?</p> <p>Δ: 26.0 V @: -22.0 V</p> <p>Δ: 82.4ms @: -89.6ms</p> <p>Ch1 2.00 V Ch2 100 V M 20.0ms A Ch1 1.20 V</p> <p>70.00 %</p> | | <p>Trig?</p> <p>Δ: 26.0 V @: -22.0 V</p> <p>Δ: 16.8ms @: -24.0ms</p> <p>Ch1 2.00 V Ch2 100 V M 20.0ms A Ch1 1.20 V</p> <p>70.00 %</p> |
| 10 | <p>DYNAMIC LOAD</p> <p>V1: 1200 mVp-p</p> | <p>I/P: 230VAC</p> <p>O/P:</p> <p>(1) FULL /50% LOAD 50%DUTY / 120HZ</p> <p>(2) FULL /50% LOAD 50%DUTY / 1KHZ</p> <p>Ta:25°C</p> | <p>642mVp-p</p> <p>518mVp-p</p> | |
| | <p>FULL /50% LOAD 50%DUTY / 120HZ</p> | <p>Trig?</p> <p>Δ: 68.0mV @: -4.00mV</p> <p>Δ: 38.4ms @: 7.20ms</p> <p>Ch1 Pk-Pk 642mV</p> <p>Ch1 100mV M 4.00ms A Ch1 412mV</p> <p>78.00 %</p> | <p>FULL /50% LOAD 50%DUTY / 1KHZ</p> | <p>Trig?</p> <p>Δ: 26.0mV @: -22.0mV</p> <p>Δ: 3.84ms @: 720μs</p> <p>Ch1 Pk-Pk 518mV</p> <p>Ch1 100mV M 400μs A Ch1 338mV</p> <p>78.00 %</p> |
| 11 | <p>TRANSIENT RECOVERY TIME</p> <p>V1: 1200 mVp-p</p> <p><500us</p> | <p>I/P: 230VAC</p> <p>O/P: 40% LOAD CHANGE</p> <p>50%DUTY/120HZ 1.25A/us</p> | <p>198mVp-p</p> <p>0 us</p> | |



INPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|-----------------------|--------------------------|--|--------------------------------------|
| 1 | INPUT VOLTAGE RANGE | 85VAC~264VAC | I/P:TESTING O/P:FULL LOAD Ta:25°C | 74V~264V |
| | | | I/P: (1)LOW-LINE-3V=82 V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) 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:100 VAC ~264 VAC O/P:FULL-MIN LOAD Ta:25°C | TEST: OK |
| 3 | INPUT CURRENT (Typ.) | 230V/ 1.6A 115V/ 2.8A | I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C | I =1.24A/ 230VAC I =2.33A/ 115VAC |
| 4 | LEAKAGE CURRENT | < 0.75mA / 240 VAC | I/P : 240 VAC O/P : Min LOAD Ta : 25°C | L-FG : 0.502mA N-FG : 0.502mA |
| 5 | NO LOAD CONSUMPTION | < 0.5W | I/P : 115VAC I/P : 230VAC O/P : NO LOAD Ta : 25°C | <0.1737 W < 0.2687W |
| 6 | EFFICIENCY(Typ.) | 87.5% | I/P:230 VAC O/P:FULL LOAD Ta:25°C | 87.58% |

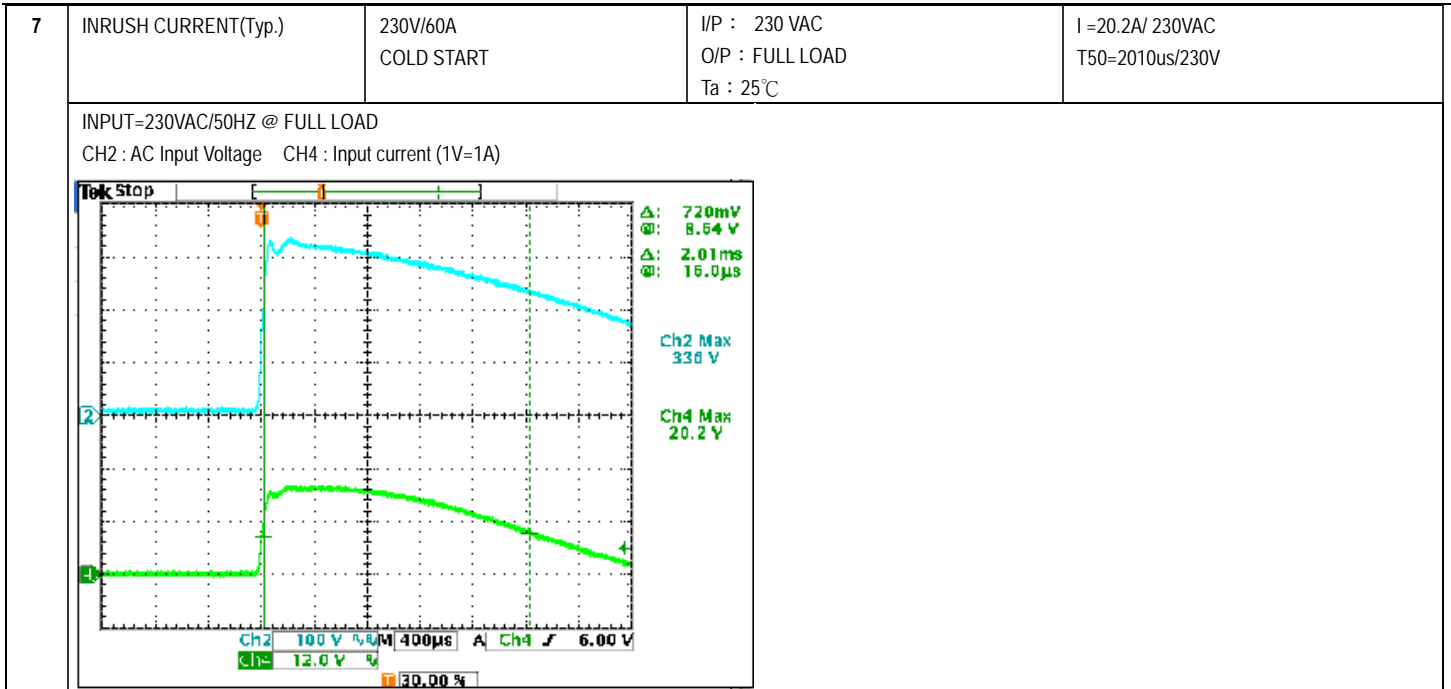
EFFICIENCY vs LOAD





150W Single Output Switching Power Supply

LRS-150F series



PROTECTION FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|-----------------------------|--|--|---|
| 1 | OVER LOAD PROTECTION | 110%~ 140 % | I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING Ta:25°C | 128%/ 264VAC 126.4%/ 230VAC 123.68%/100VAC PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed |
| 2 | OVER VOLTAGE PROTECTION | 13.8V-16.2V | I/P: 264VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD Ta:25°C | 15.40V/ 264VAC 15.39V/ 230VAC 15.36V/ 85VAC PROTECTION TYPE : Shut down o/p voltage, re-power on to recover |
| 3 | OVER TEMPERATURE PROTECTION | NO DAMAGE | I/P: 264VAC I/P: 85VAC O/P: FULL LOAD | O.T.P. Active PROTECTION TYPE : Shut down o/p voltage, re-power on to recover |
| 4 | SHORT PROTECTION | SHORT EVERY OUTPUT 1 HOUR NO DAMAGE | I/P: 264VAC I/P: 85VAC O/P: FULL LOAD Ta:25°C | NO DAMAGE PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed |

COMPONENT STRESS TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|--|-----------------------|---|--------|
| 1 | PWM Transistor (D to S) or (C to E) Peak Voltage | Q1 Rated :13A/600V | I/P: High-Line +3V =267V AC ON/OFF VDS: | VDS: |



150W Single Output Switching Power Supply

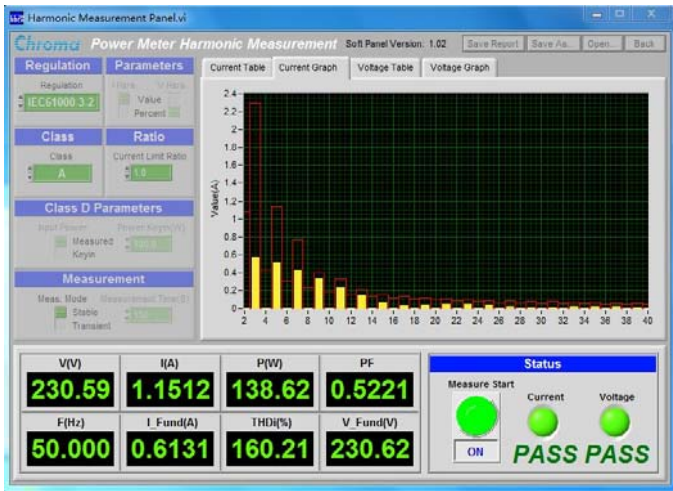
LRS-150F series

| | | | | |
|---|-------------------------|---|---|--|
| | | | O/P: (1)Full Load (2)Output Short (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4) 0%→400% Load. I/P:Low-Line -3V = 97V O/P: (1)Full Load (2)Output Short (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4) 0%→400% Load. Ta:25°C | (1) 562V (2) 566V (3) 560V (4) 570V VDS: (1) 376V (2) 326V (3) 380V (4) 380V |
| 2 | Diode Peak Voltage | Q101 Rated 20A/100V | I/P:High-Line +3V =267 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4) 0%→400% Load. (5).NO LOAD Ta:25°C | Q101: VDS: (1) 84.8V (2) 80.0V (3) 85.2V (4) 98.8V (5) 92.0V |
| 3 | Input Capacitor Voltage | C5 Rated: : 120 μ/400 V 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) 374V (2) 374V (3) 374V |
| 4 | Control IC Voltage Test | PWM IC U1 Rated : 28V 10.5V(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 下限.LOW LINE Ta:25°C | 1. 16.7V 2. 12.2V 3. 16.0V 4. 19.1V 5. 12.0V |

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: 4.4 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.5 KVAC/min Ta:25°C | I/P-O/P:3.38 mA I/P-FG: 4.00mA O/P-FG: 3.20m A 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 | 28mΩ |

E.M.C TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|--|-------------------------------|
| 1 | HARMONIC | EN61000-3-2 CLASS A | I/P:230VAC/50HZ O/P:80%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

ENVIRONMENT TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|---|---|--|---|----|----------|--------------------------|-------------------------|---|-----------|--------|--------|---|-----------|--------|--------|---|-----------|--------|--------|---|------------|--------|--------|---|------------|--------|--------|---|-------------|--------|---------|---|-------------|--------|--------|---|------------|--------|--------|---|--------------|--------|--------|----|------------|--------|--------|----|-----------|--------|--------|
| 1 | TEMPERATURE RISE TEST | MODEL : LRS-150F-12 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=27.2°C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=40.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | <table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 27.2 °C</th> <th>HIGH AMBIENT Ta=40.6 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>D6</td><td>66.2°C</td><td>77.9°C</td></tr> <tr><td>2</td><td>C6</td><td>67.4°C</td><td>76.7°C</td></tr> <tr><td>3</td><td>Q1</td><td>84.7°C</td><td>96.6°C</td></tr> <tr><td>4</td><td>C35</td><td>66.3°C</td><td>76.3°C</td></tr> <tr><td>5</td><td>BD1</td><td>86.4°C</td><td>95.7°C</td></tr> <tr><td>6</td><td>Q100</td><td>96.9°C</td><td>107.0°C</td></tr> <tr><td>7</td><td>C106</td><td>77.9°C</td><td>89.5°C</td></tr> <tr><td>8</td><td>LF1</td><td>65.6°C</td><td>76.5°C</td></tr> <tr><td>9</td><td>RTH10</td><td>75.4°C</td><td>86.7°C</td></tr> <tr><td>10</td><td>R14</td><td>73.7°C</td><td>86.1°C</td></tr> <tr><td>11</td><td>T1</td><td>82.4°C</td><td>92.4°C</td></tr> </tbody> </table> | NO | Position | ROOM AMBIENT Ta= 27.2 °C | HIGH AMBIENT Ta=40.6 °C | 1 | D6 | 66.2°C | 77.9°C | 2 | C6 | 67.4°C | 76.7°C | 3 | Q1 | 84.7°C | 96.6°C | 4 | C35 | 66.3°C | 76.3°C | 5 | BD1 | 86.4°C | 95.7°C | 6 | Q100 | 96.9°C | 107.0°C | 7 | C106 | 77.9°C | 89.5°C | 8 | LF1 | 65.6°C | 76.5°C | 9 | RTH10 | 75.4°C | 86.7°C | 10 | R14 | 73.7°C | 86.1°C | 11 | T1 | 82.4°C | 92.4°C |
| NO | Position | ROOM AMBIENT Ta= 27.2 °C | HIGH AMBIENT Ta=40.6 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | D6 | 66.2°C | 77.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | C6 | 67.4°C | 76.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Q1 | 84.7°C | 96.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | C35 | 66.3°C | 76.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | BD1 | 86.4°C | 95.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Q100 | 96.9°C | 107.0°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | C106 | 77.9°C | 89.5°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | LF1 | 65.6°C | 76.5°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | RTH10 | 75.4°C | 86.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | R14 | 73.7°C | 86.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | T1 | 82.4°C | 92.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | OVER LOAD BURN-IN TEST | NO DAMAGE 1 HOUR (MIN) | I/P : 230 VAC O/P : 113% 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 40 °C NO DAMAGE | I/P : 272 VAC O/P : FULL LOAD Ta= 45 °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%/°C (0-40°C) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



150W Single Output Switching Power Supply

LRS-150F series

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|----|-----------------------------|---|--|
| 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 : -20°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 |
| 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=45 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 45 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 45 °C LIFE TIME | (1) 81305HRS (2) 33047HRS (3) 48975HRS (4) 93362HRS |
| 10 | MTBF | MIL-HDBK-217F TOTAL FAILURE RATE : 648.6KHRS | |
| 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 |

2007/3/20 A50-S014