# LS100

# RELIABILITY DATA

| DWG. No PA577-57-01 | | |
|---|---|---|
| APPD | CHK | DWG |
| [illegible] 7-May-08 | [illegible] 7-May-08 | [illegible] 7 May 2008 |

**DENSEI-LAMBDA**

# I N D E X

PAGE



※ The above data is typical value. As all units have nearly the same characteristics, the data to be considered as ability value.

## 1. Calculated values for MTBF

## MODEL : LS100-5

### 1. Calculating Method

Calculated based on part count reliability projection of JEITA (RCR-9102A).
Individual failure rates $l_G$ is given to each part and MTBF is calculated by the count of each part.

Formula :

$$MTBF = \frac{1}{\lambda equip} = \frac{1}{\sum_{i=1}^{n} Ni(\lambda_G \pi_Q)_i} \times 10^6 \text{ (HOURS)}$$

where :

$\lambda equip$ = Total Equipment Failure Rate ( Failure / 106 Hours )

$\lambda_G$ = Generic Failure Rate For The ith Generic Part ( Failure / 106 Hours )

Ni = Quantity of ith Generic Part

n = Number of Different Generic Part Categories

$\pi_Q$ = Generic Quality Factor for the ith Generic Part ( $\pi_Q = 1$ )

### 2. MTBF Values

$G_F$ : ( GROUND, FIXED)

**MTBF = 545,375 (Hours)**

## 2. Component derating

### MODEL : LS100-5

**(1) Calculating method**

(a) Measuring Conditions

| | | | | | |
|---|---|---|---|---|---|
| Input | : | 115 , 230VAC | • Ambient temperature | : | 45°C |
| Output | : | 5V 16A(100%) | • Mounting method | : | Mounting A |

(b) Semiconductors

Compared with maximum junction temperature and actual one which is calculated based on case temperature, power dissipation and thermal impedance.

(c) IC, Resistors, Capacitors, etc.

Ambient temperature, operating condition, power dissipation and so on are within derating criteria.

(d) Calculating Method of Thermal Impedance

$$\theta_{j-c} = \frac{T_{j(max)} - T_c}{P_{c(max)}} \qquad \theta_{j-a} = \frac{T_{j(max)} - T_a}{P_{c(max)}} \qquad \theta_{j-l} = \frac{T_{j(max)} - T_l}{P_{c(max)}}$$

$T_c$ **:** Case temperature at start point of derating ; 25°C in general

$T_a$ **:** Ambient temperature at start point of derating ; 25°C in general

$T_j$ **:** Lead temperature at start point of derating ; 25°C in general

$P_{c(max)}$ ($P_{ch(max)}$) **:** Maximum collector(channel) dissipation

$T_{j(max)}$ ($T_{ch(max)}$) **:** Maximum junction(channel) temperature

($\theta_{j-c}$) ($\theta_{ch-c}$) **:** Thermal impedance between junction(channel) and case

$\theta_{j-a}$ **:** Thermal impedance between junction and air

$\theta_{j-l}$ **:** Thermal impedance between junction and lead

## (2) Component Derating List

| Location No. | Vin = 115VAC Load = 100% Ta = 45°C | | |
|---|---|---|---|
| Q2<br>STP10NK80Z<br>ST<br>MICROELECTRONICS | Tchmax = 150°C, | θ j-c = 0.78°C/W, | Pch(max) = 160W |
| | Pch = 3.91W, | Δ Tc = 59.2°C, | Tc = 104.2°C |
| | Tch = Tc + ((θ j-c) × Pch) = 107.25°C | | |
| | D.F. = 71.50% | | |
| D8<br>STPS30H60CW<br>ST<br>MICROELECTRONICS | Tjmax = 175°C, | θ j-c = 0.8°C/W, | |
| | Pd = 5.2W, | Δ Tc = 65.2°C, | Tc = 110.2°C |
| | Tj = Tc + ((θ j-c) × Pd) = 114.36°C | | |
| | D.F. = 65.35% | | |
| D9<br>STPS30H60CW<br>ST<br>MICROELECTRONICS | Tjmax = 175°C, | θ j-c = 0.8°C/W, | |
| | Pd = 5.2W, | Δ Tc = 65.2°C, | Tc = 110.2°C |
| | Tj = Tc + ((θ j-c) × Pd) = 114.36°C | | |
| | D.F. = 65.35% | | |
| D1<br>RS405M<br>RECTRON | Tjmax = 150°C, | θ j-c = 6.0°C/W | |
| | Pd = 2.94W, | Δ Tc = 61°C | Tc = 106°C |
| | Tj = Tc + ((θ j-c) × Pd) = 123.64°C | | |
| | D.F. = 82.43% | | |
| D2<br>HER208<br>RECTRON | Tjmax = 150°C, | θ j-c = 10°C/W | |
| | Pd = 0.4W, | Δ Tc = 81.1°C | Tc = 126.1°C |
| | Tj = Ta + ((θ j-c) × Pd) = 130.1°C | | |
| | D.F. = 86.73% | | |
| D4<br>CRS04<br>TOSHIBA | Tjmax = 150°C, | θ j-l =20°C/W | |
| | Pd = 2.5mW, | Δ Tl = 51.7°C | Tl = 96.7°C |
| | Tj = Tl + ((θ j-l) × Pd) = 96.75°C | | |
| | D.F. = 64.50% | | |
| D5<br>CRS04<br>TOSHIBA | Tjmax = 150°C, | θ j-l =20°C/W | |
| | Pd = 5mW, | Δ Tl = 42.2°C | Tl = 87.2°C |
| | Tj = Tl + ((θ j-l) × Pd) = 87.3°C | | |
| | D.F. = 58.20% | | |
| D6<br>CRF02<br>TOSHIBA | Tjmax = 150°C, | θ j-l =20°C/W | |
| | Pd = 39.1mW, | Δ Tl = 75.5°C | Tc = 120.5°C |
| | Tj = Ta + ((θ j-l) × Pd) = 121.28°C | | |
| | D.F. = 80.85% | | |
| D7<br>CRH01<br>TOSHIBA | Tjmax = 150°C, | θ j-l = 20°C/W | |
| | Pd = 4.1mW, | Δ Tl = 77.8°C | Tl = 122.8°C |
| | Tj = Tl + ((θ j-l) × Pd) = 122.88°C | | |
| | D.F. = 81.92% | | |

| Location No. | Vin = 115VAC Load = 100% Ta = 45°C | | |
|---|---|---|---|
| PC1<br>PS2561BL1-1-A(D)<br>(TRANSISTOR)<br>NEC | Tjmax = 125°C, | θ j-c = 150°C/W, | Pc(max) = 0.15W |
| | Pc = 3.11mW, | Δ Tc = 45.4°C, | Tc = 90.4°C |
| | Tj = Tc + ((θ j-c) × Pc) = 90.87°C | | |
| | D.F. = 72.70% | | |
| PC1<br>PS2561BL1-1-A(D)<br>(LED)<br>NEC | Tjmax = 125°C, | θ j-c = 150°C/W, | Pc(max) = 0.15W |
| | Pc = 2.34mW, | Δ Tc = 45.4°C, | Tc = 90.4°C |
| | Tj = Tc + ((θ j-c) × Pc) = 90.75°C | | |
| | D.F. = 72.60% | | |
| PC2<br>PS2561BL1-1-A(D)<br>(TRANSISTOR)<br>NEC | Tjmax = 125°C, | θ j-c = 150°C/W, | Pc(max) = 0.15W |
| | Pc = 0.0W, | Δ Tc = 47.5°C, | Tc = 92.5°C |
| | Tj = Tc + ((θ j-c) × Pc) = 92.5°C | | |
| | D.F. = 74.00% | | |
| PC2<br>PS2561BL1-1-A(D)<br>(LED)<br>NEC | Tjmax = 125°C, | θ j-c = 150°C/W, | Pc(max) = 0.15W |
| | Pc = 0.0W, | Δ Tc = 47.5°C, | Tc = 92.5°C |
| | Tj = Tc + ((θ j-c) × Pc) = 92.5°C | | |
| | D.F. = 74.00% | | |
| A1<br>FA13842N-D1-TE1<br>FUJI-ELEC. | Tjmax = 150°C, | θ j-c = 72°C/W | |
| | Pd = 0.108W, | Δ Tc = 63.1°C | Tc = 108.1°C |
| | Tj = Tc + ((θ j-c) × Pd) = 115.88°C | | |
| | D.F. = 77.25% | | |
| A2<br>HA17431PA-TZ-E<br>RENESAS | Tjmax = 150°C, | θ j-c = 100°C/W, | |
| | Pd = 7mW, | Δ Tc = 33.0°C, | Tc = 78.0°C |
| | Tj = Tc + ((θ j-c) × Pd) = 78.7°C | | |
| | D.F. = 52.47% | | |
| PD1<br>264-7GVD/S530-E2<br>EVERLIGHT | IF = 6.4mA, | Δ Tc = 32.0°C | Tc = 77.0°C |
| | Allowable IF(max)= 9mA(at Ta = 77.0°C) | | |
| | D.F. = 71.11% | | |
| | | | |

## (2) Component Derating List

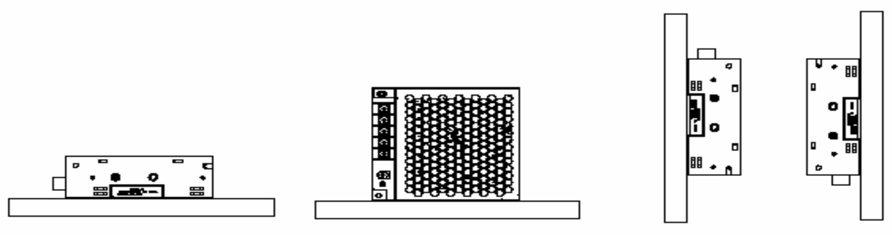
| Location No. | Vin = 230VAC | Load = 100% | Ta = 45°C |
|---|---|---|---|
| Q2<br>STP10NK80Z<br>ST<br>MICROELECTRONICS | Tchmax = 150°C, | θ j-c = 0.78°C/W, | Pch(max) = 160W |
| | Pch = 4.4W, | Δ Tc = 55.9°C, | Tc = 100.9°C |
| | Tch = Tc + ((θ j-c) × Pch) = 104.33°C | | |
| | D.F. = 69.55% | | |
| D8<br>STPS30H60CW<br>ST<br>MICROELECTRONICS | Tjmax = 175°C, | θ j-c = 0.8°C/W, | |
| | Pd = 5.2W, | Δ Tc = 61.6°C, | Tc = 106.6°C |
| | Tj = Tc + ((θ j-c) × Pd) = 110.76°C | | |
| | D.F. = 63.29% | | |
| D9<br>STPS30H60CW<br>ST<br>MICROELECTRONICS | Tjmax = 175°C, | θ j-c = 0.8°C/W, | |
| | Pd = 5.2W, | Δ Tc = 61.6°C, | Tc = 106.6°C |
| | Tj = Tc + ((θ j-c) × Pd) = 110.76°C | | |
| | D.F. = 63.29% | | |
| D1<br>RS405M<br>RECTRON | Tjmax = 150°C, | θ j-c = 6.0°C/W | |
| | Pd = 1.79W, | Δ Tc = 40.9°C | Tc = 85.9°C |
| | Tj = Tc + ((θ j-c) × Pd) = 96.64°C | | |
| | D.F. = 64.43% | | |
| D2<br>HER208<br>RECTRON | Tjmax = 150°C, | θ j-c = 10°C/W | |
| | Pd = 0.3W, | Δ Tc = 73.1°C | Tc = 118.1°C |
| | Tj = Ta + ((θ j-c) × Pd) = 121.1°C | | |
| | D.F. = 80.73% | | |
| D4<br>CRS04<br>TOSHIBA | Tjmax = 150°C, | θ j-l =20°C/W | |
| | Pd = 2.5mW, | Δ Tl = 48.7°C | Tl = 93.7°C |
| | Tj = Tl + ((θ j-l) × Pd) = 93.75°C | | |
| | D.F. = 62.50% | | |
| D5<br>CRS04<br>TOSHIBA | Tjmax = 150°C, | θ j-l =20°C/W | |
| | Pd = 4.4mW, | Δ Tl = 39.8°C | Tl = 84.8°C |
| | Tj = Tl + ((θ j-l) × Pd) = 84.89°C | | |
| | D.F. = 56.59% | | |
| D6<br>CRF02<br>TOSHIBA | Tjmax = 150°C, | θ j-l =20°C/W | |
| | Pd = 47.8mW, | Δ Tl = 73.6°C | Tc = 118.6°C |
| | Tj = Ta + ((θ j-l) × Pd) = 119.56°C | | |
| | D.F. = 79.71% | | |
| D7<br>CRH01<br>TOSHIBA | Tjmax = 150°C, | θ j-l = 20°C/W | |
| | Pd = 3.2mW, | Δ Tl = 75.5°C | Tl = 120.5°C |
| | Tj = Tl + ((θ j-l) × Pd) = 120.56°C | | |
| | D.F. = 80.37% | | |

| Location No. | Vin = 230VAC Load = 100% Ta = 45°C | | |
|---|---|---|---|
| PC1<br>PS2561BL1-1-A(D)<br>(TRANSISTOR)<br>NEC | Tjmax = 125°C, | θ j-c = 150°C/W, | Pc(max) = 0.15W |
| | Pc = 3.5mW, | Δ Tc = 38.4°C, | Tc = 83.4°C |
| | Tj = Tc + ((θ j-c) × Pc) = 83.93°C | | |
| | D.F. = 67.14% | | |
| PC1<br>PS2561BL1-1-A(D)<br>(LED)<br>NEC | Tjmax = 125°C, | θ j-c = 150°C/W, | Pc(max) = 0.15W |
| | Pc = 2.34mW, | Δ Tc = 38.4°C, | Tc = 83.4°C |
| | Tj = Tc + ((θ j-c) × Pc) = 83.75°C | | |
| | D.F. = 67.00% | | |
| PC2<br>PS2561BL1-1-A(D)<br>(TRANSISTOR)<br>NEC | Tjmax = 125°C, | θ j-c = 150°C/W, | Pc(max) = 0.15W |
| | Pc = 0.0W, | Δ Tc = 45.1°C, | Tc = 90.1°C |
| | Tj = Tc + ((θ j-c) × Pc) = 90.1°C | | |
| | D.F. = 72.08% | | |
| PC2<br>PS2561BL1-1-A(D)<br>(LED)<br>NEC | Tjmax = 125°C, | θ j-c = 150°C/W, | Pc(max) = 0.15W |
| | Pc = 0.0W, | Δ Tc = 45.1°C, | Tc = 90.1°C |
| | Tj = Tc + ((θ j-c) × Pc) = 90.1°C | | |
| | D.F. = 72.08% | | |
| A1<br>FA13842N-D1-TE1<br>FUJI-ELEC. | Tjmax = 150°C, | θ j-c = 72°C/W | |
| | Pd = 0.118W, | Δ Tc = 59.6°C | Tc = 104.6°C |
| | Tj = Tc + ((θ j-c) × Pd) = 113.1°C | | |
| | D.F. = 75.40% | | |
| A2<br>HA17431PA-TZ-E<br>RENESAS | Tjmax = 150°C, | θ j-c = 100°C/W, | |
| | Pd = 7mW, | Δ Tc = 32.8°C, | Tc = 77.8°C |
| | Tj = Tc + ((θ j-c) × Pd) = 78.5°C | | |
| | D.F. = 52.33% | | |
| PD1<br>264-7GVD/S530-E2<br>EVERLIGHT | IF = 6.4mA, | Δ Tc = 30.8°C | Tc = 75.8°C |
| | Allowable IF(max)= 9.5mA(at Ta = 75.8°C) | | |
| | D.F. = 67.37% | | |
| | | | |

## 3. Main components temperature rise ΔT list

**MODEL : LS100-5**

Condition:

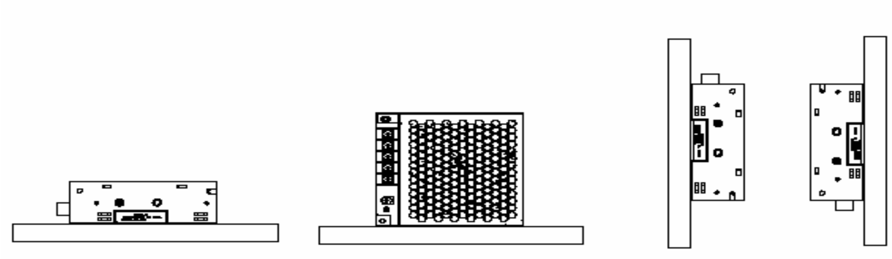
| | (A) |
|---|---|
| Standard Mounting (Mounting Method (A)) |  Mounting A Mounting B Mounting C Mounting D |
| Input Voltage (VAC) | 115 |
| Output Voltage (VDC) | 5 |
| Output Current (A) | 16 |

| | | | ΔT Temperature rise (°C) | | |
|---|---|---|---|---|---|
| Output Derating Ta = 45°C | | Io=100% | Io=100% | Io=100% | Io=100% |
| Location No | Parts Name | Mounting (A) | Mounting (B) | Mounting (C) | Mounting (D) |
| F1 | FUSE | 27.2 | 32.9 | 45.3 | 25.3 |
| L1 | BALUN COIL | 43.0 | 48.1 | 56.7 | 38.3 |
| L2 | CHOKE COIL | 62.7 | 57.1 | 66.2 | 52.2 |
| L3 | CHOKE COIL | 57.7 | 62.4 | 65.6 | 50.2 |
| T1 | TRANS. PULSE | 67.2 | 59.2 | 57.1 | 62.6 |
| Q2 | MOSFET | 59.2 | 57.4 | 53.6 | 62.6 |
| D1 | BRIDGE DIODE | 61.0 | 65.6 | 63.6 | 64.0 |
| D8 | F.R. DIODE | 65.2 | 61.1 | 59.3 | 61.0 |
| D9 | F.R. DIODE | 65.2 | 58.8 | 58.1 | 56.5 |
| A1 | CHIP IC | 63.1 | 55.8 | 51.8 | 65.0 |
| A2 | SHUNT REGULATOR | 33.0 | 41.2 | 57.0 | 26.9 |
| PC1 | PHOTOCOUPLER | 45.4 | 42.2 | 38.1 | 43.4 |
| PC2 | PHOTOCOUPLER | 47.5 | 42.6 | 40.7 | 45.1 |
| PD1 | LED | 32.0 | 35.1 | 52.7 | 27.2 |
| C7 | CAP. FILM | 45.8 | 55.1 | 52.8 | 55.8 |
| C9 | CAP. ELECT. | 41.6 | 44.8 | 34.8 | 50.0 |
| C10 | CAP. ELECT. | 42.7 | 48.0 | 40.0 | 48.1 |
| C24 | CAP. ELECT. | 54.1 | 45.7 | 41.8 | 58.6 |
| C28 | CAP. ELECT. | 57.1 | 51.2 | 52.9 | 48.2 |
| C29 | CAP. ELECT. | 54.2 | 51.4 | 53.3 | 46.1 |
| C30 | CAP. ELECT. | 51.9 | 51.8 | 54.4 | 44.0 |
| C31 | CAP. ELECT. | 52.8 | 47.4 | 50.0 | 44.3 |
| C32 | CAP. ELECT. | 50.4 | 47.9 | 51.3 | 43.1 |
| C33 | CAP. ELECT. | 44.4 | 43.4 | 49.5 | 37.0 |
| C34 | CAP. ELECT. | 41.8 | 45.9 | 51.7 | 36.0 |

## 3. Main components temperature rise ΔT list

**MODEL : LS100-5**

Condition:

| | (A) |
|---|---|
| Standard Mounting (Mounting Method (A)) |  Mounting A, Mounting B, Mounting C, Mounting D |
| Input Voltage (VAC) | 230 |
| Output Voltage (VDC) | 5 |
| Output Current (A) | 16 |

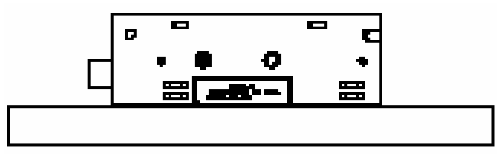
| | | | ΔT Temperature rise (°C) | | |
|---|---|---|---|---|---|
| Output Derating Ta = 45°C | | Io=100% | Io=100% | Io=100% | Io=100% |
| Location No | Parts Name | Mounting (A) | Mounting (B) | Mounting (C) | Mounting (D) |
| F1 | FUSE | 22.1 | 28.1 | 33.6 | 20.3 |
| L1 | BALUN COIL | 27.6 | 34.6 | 38.2 | 23.9 |
| L2 | CHOKE COIL | 38.9 | 39.8 | 44.1 | 31.8 |
| L3 | CHOKE COIL | 57.4 | 61.4 | 64.9 | 49.1 |
| T1 | TRANS. PULSE | 65.7 | 56.7 | 56.2 | 60.7 |
| Q2 | MOSFET | 55.9 | 54.3 | 50.1 | 57.7 |
| D1 | BRIDGE DIODE | 40.9 | 49.7 | 46.0 | 42.7 |
| D8 | F.R. DIODE | 61.6 | 58.8 | 56.7 | 58.0 |
| D9 | F.R. DIODE | 61.6 | 57.2 | 55.9 | 54.2 |
| A1 | CHIP IC | 59.6 | 55.6 | 51.7 | 64.4 |
| A2 | SHUNT REGULATOR | 32.8 | 40.1 | 56.4 | 26.3 |
| PC1 | PHOTOCOUPLER | 38.4 | 40.5 | 37.3 | 41.1 |
| PC2 | PHOTOCOUPLER | 45.1 | 41.5 | 39.3 | 42.9 |
| PD1 | LED | 30.8 | 34.9 | 51.6 | 26.7 |
| C7 | CAP. FILM | 33.3 | 44.4 | 39.8 | 37.8 |
| C9 | CAP. ELECT. | 38.1 | 42.3 | 31.6 | 44.1 |
| C10 | CAP. ELECT. | 36.7 | 44.6 | 34.9 | 38.7 |
| C24 | CAP. ELECT. | 52.7 | 45.4 | 40.6 | 56.9 |
| C28 | CAP. ELECT. | 53.8 | 49.5 | 50.5 | 45.5 |
| C29 | CAP. ELECT. | 51.5 | 50.0 | 51.0 | 43.7 |
| C30 | CAP. ELECT. | 50.3 | 51.1 | 52.4 | 42.6 |
| C31 | CAP. ELECT. | 48.4 | 45.8 | 47.4 | 41.4 |
| C32 | CAP. ELECT. | 47.0 | 46.3 | 48.4 | 40.4 |
| C33 | CAP. ELECT. | 42.3 | 42.2 | 46.5 | 35.1 |
| C34 | CAP. ELECT. | 40.6 | 45.3 | 49.2 | 34.8 |

## 4. Electrolytic capacitor lifetime

**MODEL : LS100-5**

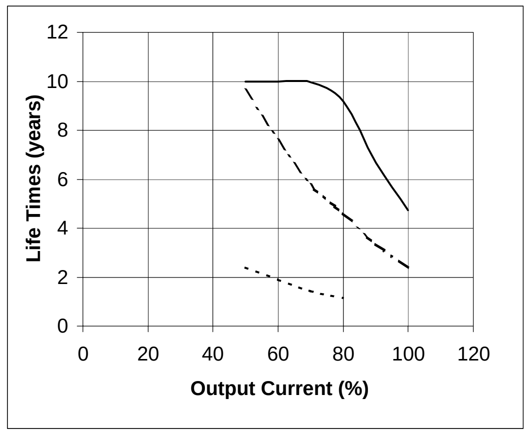
Ta = 40°C ——
= 50°C — · — · —
= 70°C ··········

Mounting A



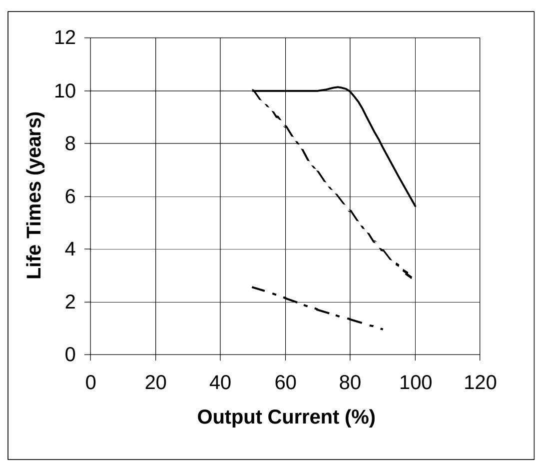
Vin = 115VAC

| Load (%) | Life Time (years) | | |
|---|---|---|---|
| | Ta = 40°C | Ta = 50°C | Ta = 70°C |
| 50 | 10.0 | 9.6 | 2.4 |
| 60 | 10.0 | 7.6 | 1.9 |
| 70 | 10.0 | 5.8 | 1.4 |
| 80 | 9.2 | 4.6 | 1.1 |
| 90 | 6.7 | 3.3 | —— |
| 100 | 4.7 | 2.4 | —— |




Vin = 230VAC

| Load (%) | Life Time (years) | | |
|---|---|---|---|
| | Ta = 40°C | Ta = 50°C | Ta = 70°C |
| 50 | 10.0 | 10.0 | 2.6 |
| 60 | 10.0 | 8.6 | 2.2 |
| 70 | 10.0 | 6.9 | 1.7 |
| 80 | 10.0 | 5.4 | 1.4 |
| 90 | 7.8 | 3.9 | 1.0 |
| 100 | 5.6 | 2.8 | —— |



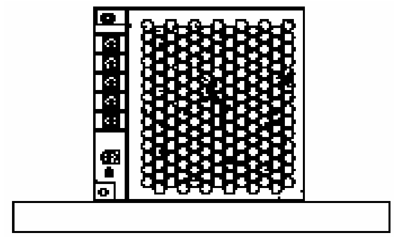

Note : E-cap life calculation is based on 8hrs/day operation.

## 4. Electrolytic capacitor lifetime

**MODEL : LS100-5**

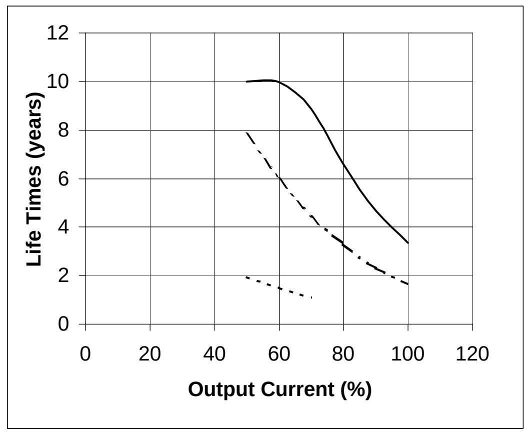
Ta = 40°C ———
= 50°C — · — · —
= 70°C ··············

Mounting B



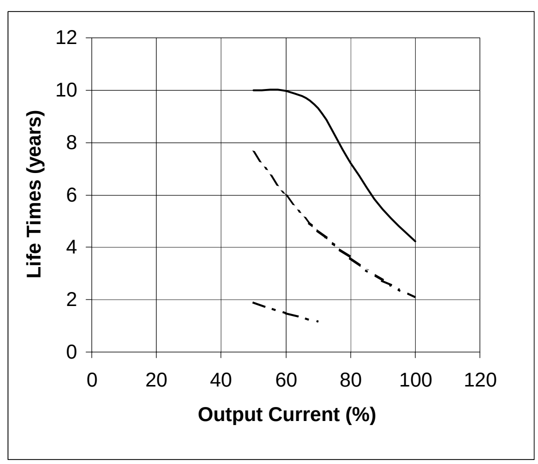
Vin = 115VAC

| Load (%) | Life Time (years) | | |
|---|---|---|---|
| | Ta = 40°C | Ta = 50°C | Ta = 70°C |
| 50 | 10.0 | 7.8 | 2.0 |
| 60 | 10.0 | 6.0 | 1.5 |
| 70 | 8.9 | 4.4 | 1.1 |
| 80 | 6.6 | 3.3 | —— |
| 90 | 4.7 | 2.3 | —— |
| 100 | 3.3 | 1.7 | —— |




Vin = 230VAC

| Load (%) | Life Time (years) | | |
|---|---|---|---|
| | Ta = 40°C | Ta = 50°C | Ta = 70°C |
| 50 | 10.0 | 7.6 | 1.9 |
| 60 | 10.0 | 6.0 | 1.5 |
| 70 | 9.3 | 4.7 | 1.2 |
| 80 | 7.2 | 3.6 | —— |
| 90 | 5.5 | 2.7 | —— |
| 100 | 4.2 | 2.1 | —— |

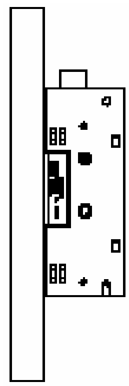



Note : E-cap life calculation is based on 8hrs/day operation.

## 4. Electrolytic capacitor lifetime

**MODEL : LS100-5**

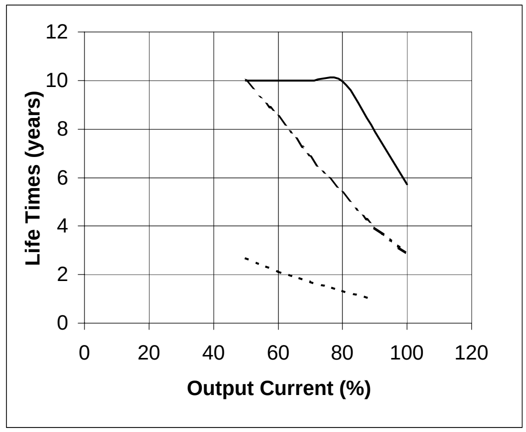
Mounting C



Ta = 40°C ——
= 50°C — · — · —
= 70°C ··········

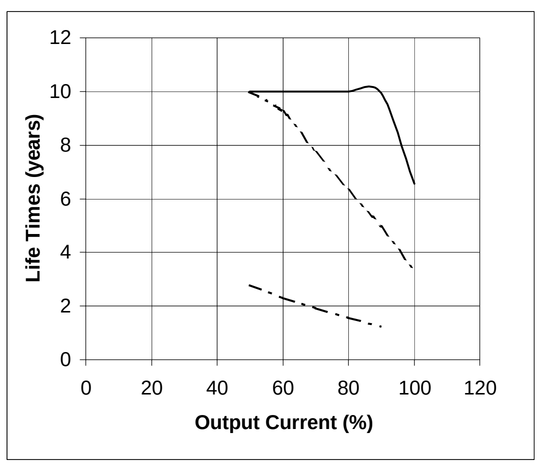
Vin = 115VAC

| Load (%) | Life Time (years) | | |
|---|---|---|---|
| | Ta = 40°C | Ta = 50°C | Ta = 70°C |
| 50 | 10.0 | 10.0 | 2.7 |
| 60 | 10.0 | 8.5 | 2.1 |
| 70 | 10.0 | 6.9 | 1.7 |
| 80 | 10.0 | 5.4 | 1.3 |
| 90 | 7.9 | 3.9 | 1.0 |
| 100 | 5.7 | 2.9 | —— |




Vin = 230VAC

| Load (%) | Life Time (years) | | |
|---|---|---|---|
| | Ta = 40°C | Ta = 50°C | Ta = 70°C |
| 50 | 10.0 | 10.0 | 2.8 |
| 60 | 10.0 | 9.2 | 2.3 |
| 70 | 10.0 | 7.7 | 1.9 |
| 80 | 10.0 | 6.3 | 1.6 |
| 90 | 9.9 | 5.0 | 1.2 |
| 100 | 6.6 | 3.3 | —— |

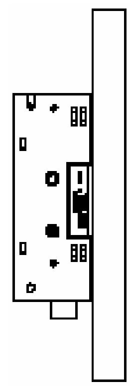



Note : E-cap life calculation is based on 8hrs/day operation.

**4. Electrolytic capacitor lifetime**

**MODEL :   LS100-5**

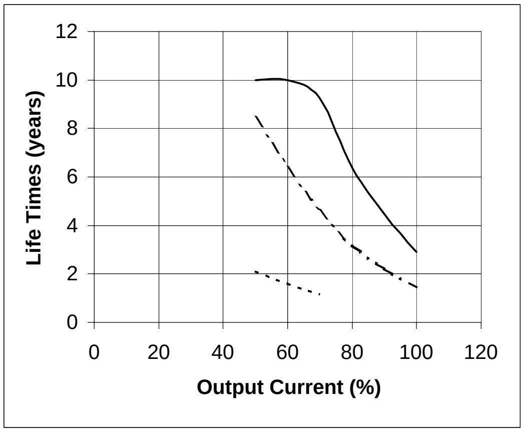
Mounting D



Ta = 40°C
= 50°C
= 70°C

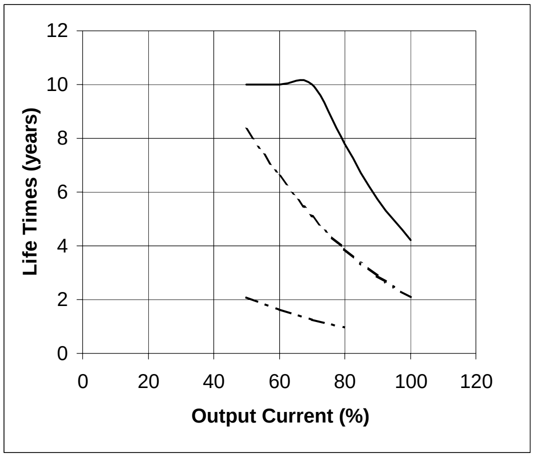
Vin = 115VAC

| Load (%) | Life Time (years) | | |
|---|---|---|---|
| | Ta = 40°C | Ta = 50°C | Ta = 70°C |
| 50 | 10.0 | 8.5 | 2.1 |
| 60 | 10.0 | 6.4 | 1.6 |
| 70 | 9.2 | 4.6 | 1.2 |
| 80 | 6.4 | 3.2 | —— |
| 90 | 4.5 | 2.2 | —— |
| 100 | 2.9 | 1.5 | —— |




Vin = 230VAC

| Load (%) | Life Time (years) | | |
|---|---|---|---|
| | Ta = 40°C | Ta = 50°C | Ta = 70°C |
| 50 | 10.0 | 8.3 | 2.1 |
| 60 | 10.0 | 6.6 | 1.6 |
| 70 | 10.0 | 5.1 | 1.3 |
| 80 | 7.8 | 3.9 | 1.0 |
| 90 | 5.7 | 2.9 | —— |
| 100 | 4.2 | 2.1 | —— |




Note : E-cap life calculation is based on 8hrs/day operation.

## 5. Vibration Test

**MODEL : LS100-5**

### (1) Vibration Test Class

Frequency Variable Endurance Test

### (2) Equipment Used

| | | |
|---|---|---|
| Controller | : | F-400-BM-E47 (EMIC CORP.) |
| Vibrator | : | 905-FN (EMIC CORP.) |
| Serial no. | : | 22965 |

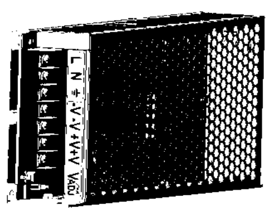
### (3) The Number Of D.U.T. (Device Under Test)

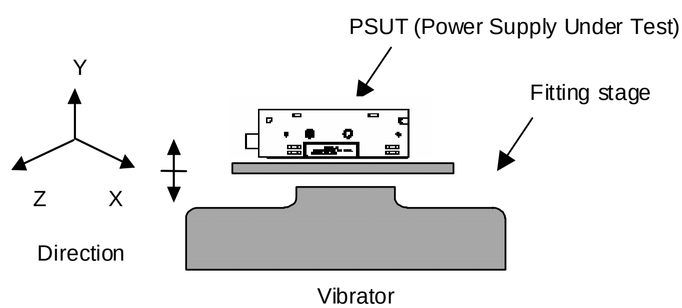
1 Unit

### (4) Test Conditions

| | | | | | |
|---|---|---|---|---|---|
| Sweep Frequency | : | 10 - 55Hz | Direction | : | X, Y, Z |
| Sweep Time | : | 1 minute | Test Time | : | 1 hour each axis |
| Acceleration | : | 2G | Non-operation | | |
| Mounting | : | A and B | | | |

### (5) Test Method






Fix the PSUT on the universal plate via two M3 tapped holes on the chassis of the power supply.
Standard mounting position as per test specification.

### (6) Test results - OK

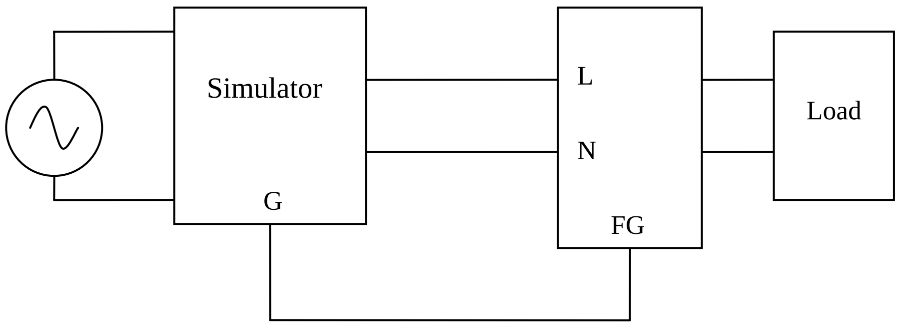
| | | | |
|---|---|---|---|
| Test Conditions : | Vin = 230 Vac | | Load Condition : |
| | Ambient Temp. = +25 °C | | Full Load |

| Check Item | | Output Voltage (V) | PSUT State |
|---|---|---|---|
| Before Test | | Vo1 | |
| | | 5.003 | |
| After test | X | 5.003 | OK |
| | Y | 5.003 | OK |
| | Z | 5.003 | OK |

## 6. Noise simulate test

**MODEL : LS100-5**

**(1) Test circuit and equipment**




Simulator : INS-400L Noise Laboratory Co.,LTD

**(2) Test conditions**

| | | | | | |
|---|---|---|---|---|---|
| • Input voltage | : | 115, 230VAC | • Noise level | : | 0V~2.4kV |
| • Output voltage | : | Rated | • Phase shift | : | 0° ~ 360° |
| • Output current | : | 0%, 100% | • Polarity | : | + , - |
| • Ambient temperature | : | 25°C | • Mode | : | Normal Common |
| • Pulse Width | : | 0ns ~ 1000ns | • Trigger select | : | Line |

**(3) Acceptable conditions**

1. Not to be broken.
2. No output shutdown.
3. No other out of order.

**(4) Test result O K**

## 7. Abnormal test

**MODEL : LS100-5**

**(1) Test Condition**

Input Voltage : 230VAC Output Current : 100% Ta : 25°C, 70% RH

**(2) Test Results**

(Da: Damaged)

| No. | Test Position | | Test Mode | | Test Results | | | | | | | | | | | | NOTE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LOCATION | TEST POINT | SHORT | OPEN | 1 FIRE | 2 SMOKE | 3 BURST | 4 SMELL | 5 RED HOT | 6 DAMAGE | 7 FUSE BLOW | 8 O.C.P. | 9 O.V.P. | 10 NO OUTPUT | 11 NO CHANGE | 12 OTHER | |
| 1 | D1 | (+) - (-) | • | | | | | | | • | • | | | • | | | Da : F1 |
| 2 | D2 | | • | | | | | | | | | | | • | | | |
| | | | | • | | | | | | | | | | | | • | Hiccup |
| 3 | D3 | | • | | | | | | | | | | | • | | • | Latch |
| | | | | • | | | | | | | | | | | • | | |
| 4 | D4 | | • | | | | | | | | | | | | • | | |
| | | | | • | | | | | | | | | | • | | • | Hiccup |
| 5 | D5 | | • | | | | | | | | | | | | • | | |
| | | | | • | | | | | | | | | | | • | | |
| 6 | D6 | | • | | | | | | | | | | | | • | | |
| | | | | • | | | | | | | | | | | • | | |
| 7 | D7 | | • | | | | | | | • | • | | | • | | | Da : F1,Q2,Z4,D2 |
| | | | | • | | | | | | | | | | • | | | |
| 8 | D8/D9 | | • | | | | | | | | | | | • | | | No Damage |
| | | | | • | | | | | | • | | | | • | | | Da : R43, A1 |
| 9 | Q1 | 3 - 4 | • | | | | | | | | | | | • | | • | Latch |
| | | | | • | | | | | | | | | | | • | | |
| | | 1 - 6 | • | | | | | | | | | | | • | | • | Latch |
| | | | | • | | | | | | | | | | | • | | |
| | | 3 - 5 | • | | | | | | | | | | | • | | • | Latch |
| | | | | • | | | | | | | | | | | • | | |
| | | 6 - 2 | • | | | | | | | | | | | • | | • | Latch |
| | | | | • | | | | | | | | | | | • | | |
| 10 | Q2 | G - S | • | | | | | | | • | | | | • | | | Da : R43 |
| | | D - G | • | | | | | | | • | • | | | • | | | Da : R43,Z1,Z2,F1 |
| | | D - S | • | | | | | | | • | • | | | • | | | Da : F1,R43,Z1 |
| 11 | Q3 | C - E | • | | | | | | | | | | | | • | | |
| | | B - E | • | | | | | | | | | | | | | • | Hiccup |
| | | C - B | • | | | | | | | | | | | | • | | |
| 12 | C9/C10 | (+)Bulk - (-)Bulk | • | | | | | | | • | • | | | • | | | Da : F1 |
| 13 | C13 | | • | | | | | | | • | • | | | • | | | Da : F1,Z2 |
| | | | | • | | | | | | | | | | | • | | |

## 7. Abnormal test

### MODEL : LS100-5

**(1) Test Condition**

Input Voltage : 230VAC　　Output Current　: 100%　　Ta　: 25°C, 70% RH

**(2) Test Results**

(Da: Damaged)

| No. | Test Position: LOCATION | Test Position: TEST POINT | Test Mode: SHORT | Test Mode: OPEN | 1 FIRE | 2 SMOKE | 3 BURST | 4 SMELL | 5 RED HOT | 6 DAMAGE | 7 FUSE BLOW | 8 O.C.P. | 9 O.V.P. | 10 NO OUTPUT | 11 NO CHANGE | 12 OTHER | NOTE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | C17/R39 | C17/R39 | • | | | | | | | | | | | • | | | |
| | | C17 | | • | | | | | | • | • | | | • | | | Da : F1,Q2,Z1 |
| | | R39 | | • | | | | | | | | | | | • | | |
| 15 | C18 | | • | | | | | | | | | | | • | | | |
| | | | | • | | | | | | | | | | | | • | Hissing sound |
| 16 | C21 | | • | | | | | | | • | • | | | • | | | Da : F1,Q2,Z1,Z2 |
| | | | | • | | | | | | | | | | | • | | |
| 17 | C38/C39 | | • | | | | | | | | | | | | • | | |
| | | | | • | | | | | | | | | | | | • | Hissing sound |
| 18 | PC1 | 1 - 2 | • | | | | | | | | | | • | • | | • | Latch |
| | | 3 - 4 | • | | | | | | | | | | | • | | | |
| | | 1 - 2 | | • | | | | | | | | | • | • | | • | Latch |
| | | 3 - 4 | | • | | | | | | | | | • | • | | • | Latch |
| 19 | PC2 | 3 - 4 | • | | | | | | | | | | | • | | • | Latch |
| | | | | • | | | | | | | | | | | • | | |
| | | 1 - 2 | • | | | | | | | | | | | | • | | |
| | | | | • | | | | | | | | | | | • | | |
| 20 | A1 | Vcc - GND | • | | | | | | | | | | | • | | | |
| | | Vref - GND | • | | | | | | | | | | | • | | | |
| | | Isense - GND | • | | | | | | | | | | | • | | | |
| | | RtCt - GND | • | | | | | | | | | | | • | | | |
| | | FB - GND | • | | | | | | | | | | | | • | | |
| | | Comp - GND | • | | | | | | | | | | | • | | | |
| | | Out - GND | • | | | | | | | | | | | • | | | |
| 21 | A2 | A - K | • | | | | | | | | | | | | | • | Vo = 1.34 |
| | | R - K | • | | | | | | | | | | | | | • | Vo = 3.78 |
| | | R - A | • | | | | | | | | | | • | • | | • | Latch |
| 22 | T1 | Np | • | | | | | | | • | • | | | • | | | Da : F1,Q1,Z3,Z4 |
| | | Nbias | • | | | | | | | • | • | | | • | | | Da : F1,Q1,D2,Z4 |
| | | Ns | • | | | | | | | • | • | | | • | | | Da : F1,Q1 |
| 23 | PD1 | | • | | | | | | | | | | | | | • | No Led Light |
| | | | | • | | | | | | | | | | | | • | No Led Light |

## 7. Abnormal test

### MODEL : LS100-5

**(1) Test Condition**

Input Voltage : 230VAC    Output Current : 100%    Ta : 25°C, 70% RH

**(2) Test Results**

(Da: Damaged)

| No. | Test Position | | Test Mode | | Test Results | | | | | | | | | | | | NOTE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LOCATION | TEST POINT | SHORT | OPEN | 1 FIRE | 2 SMOKE | 3 BURST | 4 SMELL | 5 RED HOT | 6 DAMAGE | 7 FUSE BLOW | 8 O.C.P. | 9 O.V.P. | 10 NO OUTPUT | 11 NO CHANGE | 12 OTHER | |
| 24 | Z1 | | • | | | | | | | | | | | • | | | |
| | | | | • | | | | | | | | | | | • | | |
| 25 | Z2 | | • | | | | | | | | | | | | | • | Hissing sound |
| | | | | • | | | | | | | | | | | • | | |
| 26 | Z4 | | • | | | | | | | | | | | • | | • | Latch |
| | | | | • | | | | | | | | | | | • | | |
| 27 | R9/R10/C11 | R9/R10/C11 | • | | | | | | | | | | | • | | | |
| | | R9 & R10 | | • | | | | | | | | | | | • | | |
| | | C11 | | • | | | | | | | | • | | • | | | |
| 28 | R18 | | • | | | | | | | | | | | | • | | |
| | | | | • | | | | | | | | | | | • | | |
| 29 | R26 | | • | | | | | | | | | | | | • | | |
| | | | | • | | | | | | | | | | • | | | |
| 30 | R32~R36 | | • | | | | | | | | | | | | • | | |
| | | | | • | | | | | | | | | | | • | | |
| 31 | R42 | | • | | | | | | | | | | | | • | | |
| | | | | • | | | | | | • | • | | | • | | | Da : F1,Q2,Z2 |
| 32 | R43 | | • | | | | | | | | | | | | | • | Hissing sound |
| | | | | • | | | | | | | | | | • | | | |
| 33 | R55 | | • | | | | | | | | | | • | • | | • | Latch |
| | | | | • | | | | | | | | | • | • | | • | Latch |
| 34 | R56 | | • | | | | | | | | | | | | • | | |
| | | | | • | | | | | | | | | | | | • | Hissing sound |
| 35 | VR1 | | • | | | | | | | | | | | | | • | Vo = 5.73 |
| | | | | • | | | | | | | | | | | | • | Vo = 3.25 |

## 8. Thermal shock test

**MODEL : LS100**

**(1) Equipment used**

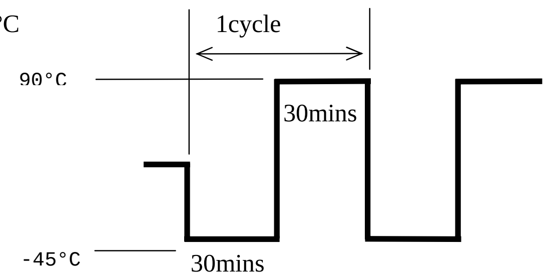
THERMAL SHOCK CHAMBER TSA-101S-W (ESPEC CORP.)

**(2) The number of D.U.T.(Device Under Test)**

1 unit

**(3) Test Conditions**

- Ambient temperature : -45°C ⟷ 90°C
- Test time : 30 mins each temp.
- Test cycle : 100 cycles
- Not operating




**(4) Test Method**

Before testing, check if there is no abnormal output, then put the D.U.T. in testing chamber, and test it according to the above cycle. 100 cycles later, leave it for 1 hour at the room temperature, then check if there is no abnormal output.

**(5) Test Results OK**

| Vin : 230VAC<br>Io : 100% | | | 3.3V | | | |
|---|---|---|---|---|---|---|
| | | | From | | To | |
| Ripple&Spike noise | | mV | 13.52 | | 16 | |
| Line regulation | Full load | mV | 14 | | 3 | |
| Load regulation | Vin:115V | mV | 39 | | 10 | |
| Efficiency | Pin | W | 87.93 | 74.44% | 87.85 | 75.47% |
| | Vout | V | 3.273 | | 3.315 | |
| | Iout | A | 20 | | 20 | |
| Solder condition • etc. | | | ――― | | OK | |