# Z+200 H.V Series

## RELIABILITY

## DATA

| DWG No.: IA779-79-02 | | |
|---|---|---|
| APPD | CHK | DWG |
| J<br>1/7/14 | Kami S.<br>June-30-14 | Ron B.<br>22/6/14 |

**TDK-Lambda**

## INDEX PAGE



Terminology used

FG..... Frame Ground

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

## 1. Calculated value of MTBF

**MODEL : 160V-1.3A**

### (1) Calculating Method

Method of calculation according to MIL-HDBK-217F.
Individual failure rates is given to each part, and MTBF is calculated by the count of each part.

Formula:

$$MTBF = \frac{1}{\lambda_{equip}} \times 10^6 = \frac{1}{\sum_{i=1}^{n} N_i(\lambda_G \pi_Q)_i} \times 10^6 (hours)$$

Where:

$\lambda_{equip}$ = Total Equipment Failure Rate (Failures / $10^6$ Hours)

$\lambda_G$ = Generic Failure Rate For The $i$ th Generic Part (Failure / $10^6$ Hours)

$N_i$ = Quantity of $i$ th Generic Part

$n$ = Number of Different Generic Part Categories

$\pi_Q$ = Generic Quality factor for the $i$ th Generic Part ($\pi_Q$ = 1)

### (2) MTBF Values

$G_F$ : (GROUND, FIXED)

**MTBF = 75,839 (HOURS)**

(MTBF calculation for fan isn't included.)

## 2. Components derating

**MODEL : 160V-1.3A**

### (1) Calculation method

1. Measuring Conditions

Input: 100 , 200Vac — Ambient temperature: 50°C

Output: 160V - 1.3A (100%) — Mounting Method: Standard Mounting

2. Semiconductors

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

3. IC, Resistors, Capasitors, etc.

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

4. Calculation Method of Thermal Impedance:

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

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

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

$Pc\,(\max)$ : Maximum power dissipation

$Tj\,(\max)$ : Maximum junction temperature

$\Theta_{j-c}$ : Thermal impedance between junction and case

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

| Location No. | Vin = 100Vac | | Load=100% | | Ta=50°C | | | |
|---|---|---|---|---|---|---|---|---|
| A101 | Tjmax= | 150 °C | θj-a = | 120.0 | °C/W | | | |
| L4981AD013TR | Pd = | 0.23 W | ΔTa = | 15.0 | °C | Ta = | 65.0 | °C |
| ST | Tj = Ta + (θ j-a x Pd) => | | Tj = | 92.6 | °C | D.F. = | 61.7 | % |
| D101 | Tjmax= | 150 °C | θj-c = | 1.0 | °C/W | | | |
| D25XB60-7000 | Pd = | 4.0 W | ΔTc = | 25.7 | °C | Tc = | 75.7 | °C |
| SHINDENGEN | Tj = Tc + (θ j-c x Pd) => | | Tj = | 79.7 | °C | D.F. = | 53.1 | % |
| D106 | Tjmax= | 150 °C | θj-c = | 2.6 | °C/W | | | |
| STTH806DTI | Pd = | 2.6 W | ΔTc = | 26.0 | °C | Tc = | 76.0 | °C |
| ST | Tj = Tc + (θ j-c x Pd) => | | Tj = | 82.8 | °C | D.F. = | 55.2 | % |
| D116 | Tjmax= | 175 °C | θj-c = | 2.0 | °C/W | | | |
| IDH02SG120 | Pd = | 1.00 W | ΔTc = | 26.4 | °C | Tc = | 76.4 | °C |
| INFINEON | Tj = Tc + (θ j-c x Pd) => | | Tj = | 78.4 | °C | D.F. = | 44.8 | % |
| Q101 | Tjmax= | 150 °C | θj-c = | 0.5 | °C/W | | | |
| IPW60R190C6 | Pd = | 4.90 W | ΔTc = | 20.4 | °C | Tc = | 70.4 | °C |
| INFINEON | Tj = Tc + (θ j-c x Pd) => | | Tj = | 72.9 | °C | D.F. = | 48.6 | % |
| Q105 | Tjmax= | 150 °C | θj-c = | 0.8 | °C/W | | | |
| SPP15N60C3 | Pd = | 2.80 W | ΔTc = | 40.4 | °C | Tc = | 90.4 | °C |
| INFINEON | Tj = Tc + (θ j-c x Pd) => | | Tj = | 92.6 | °C | D.F. = | 61.8 | % |
| SC101 | Tjmax= | 125 °C | θj-c = | 1.2 | °C/W | | | |
| CR12CM-12A B00 | Pd = | 1.0 W | ΔTc = | 20.0 | °C | Tc = | 70.0 | °C |
| RENESAS | Tj = Tc + (θ j-c x Pd) => | | Tj = | 71.2 | °C | D.F. = | 57.0 | % |
| PC101 | Tjmax= | 125 °C | θj-c = | 1666.7 | °C/W | | | |
| PS2801-1-F3-A(P) | Pd = | 0.001 W | ΔTc = | 5.6 | °C | Tc = | 55.6 | °C |
| NEC | Tj = Tc + (θ j-c x Pd) => | | Tj = | 57.3 | °C | D.F. = | 45.8 | % |
| Q117 | Tjmax= | 150 °C | θj-c = | 0.61 | °C/W | | | |
| FMH09N90E | Pd = | 0.0 W | ΔTc = | 22.0 | °C | Tc = | 72.0 | °C |
| FUJI | Tj = Tc + (θ j-c x Pd) => | | Tj = | 72.0 | °C | D.F. = | 48.0 | % |

| Location No. | Vin=100Vac Load=100% Ta=50°C | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| A109 | Tjmax= | 150 | °C | θj-c = | 14.0 | °C/W | | | |
| AD7798BRUZ | Pd = | 0.002 | W | ΔTc = | 20.0 | °C | Tc = | 67.4 | °C |
| ANALOG DEVICES | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 67.4 | °C | D.F. = | 45.0 | % |
| A110 | Tjmax= | 150 | °C | θj-a = | 136.9 | °C/W | | | |
| DAC8830ICDRG4 | Pd = | 0.0001 | W | ΔTa = | 20.0 | °C | Ta = | 64.2 | °C |
| TI | Tj = Ta + (θ j-a x Pd) => | | | Tj = | 64.2 | °C | D.F. = | 42.8 | % |
| A115 | Tjmax= | 150 | °C | θj-a = | 46.0 | °C/W | | | |
| STM32F105VCT6TR | Pd = | 0.434 | W | ΔTa = | 15.0 | °C | Ta = | 59.2 | °C |
| ST | Tj = Ta + (θ j-a x Pd) => | | | Tj = | 79.2 | °C | D.F. = | 52.8 | % |
| A126 | Tjmax= | 150 | °C | θj-c = | 3.0 | °C/W | | | |
| L4941BV | Pd = | 0.6 | W | ΔTc = | 10.4 | °C | Tc = | 60.4 | °C |
| ST | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 62.2 | °C | D.F. = | 41.5 | % |
| A127 | Tjmax= | 125 | °C | θj-c = | 4.0 | °C/W | | | |
| LM3940IT-3.3NOPB | Pd = | 0.5 | W | ΔTc = | 10.6 | °C | Tc = | 60.6 | °C |
| NATIONAL | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 62.6 | °C | D.F. = | 50.1 | % |
| A141 | Tjmax= | 125 | °C | θj-a = | 180.0 | °C/W | | | |
| LM78L15ACM NOPB | Pd = | 0.1 | W | ΔTa = | 18.2 | °C | Ta = | 68.2 | °C |
| NATIONAL | Tj = Ta + (θ j-a x Pd) => | | | Tj = | 86.2 | °C | D.F. = | 69.0 | % |
| A142 | Tjmax= | 150 | °C | θj-c = | 3.0 | °C/W | | | |
| MIP2E5DMY | Pd = | 1.4 | W | ΔTc = | 27.2 | °C | Tc = | 77.2 | °C |
| MATSUSHITA | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 81.4 | °C | D.F. = | 54.3 | % |
| A145 | Tjmax= | 125 | °C | θj-a = | 231.0 | °C/W | | | |
| LM78L05ACMNOPB | Pd = | 0.08 | W | ΔTa = | 16.2 | °C | Ta = | 66.2 | °C |
| NATIONAL | Tj = Ta + (θ j-a x Pd) => | | | Tj = | 84.7 | °C | D.F. = | 67.8 | % |
| D122 | Tjmax= | 150 | °C | θj-c = | 130.0 | °C/W | | | |
| CRH01(TE85L,Q) | Pd = | 0.06 | W | ΔTc = | 15.4 | °C | Tc = | 65.4 | °C |
| TOSHIBA | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 73.2 | °C | D.F. = | 48.8 | % |
| D130 | Tjmax= | 150 | °C | θj-c = | 130.0 | °C/W | | | |
| CRH01(TE85L,Q) | Pd = | 0.03 | W | ΔTc = | 24.5 | °C | Tc = | 74.5 | °C |
| TOSHIBA | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 78.4 | °C | D.F. = | 52.3 | % |
| D136 | Tjmax= | 150 | °C | θj-c = | 130.0 | °C/W | | | |
| CRH01(TE85L,Q) | Pd = | 0.03 | W | ΔTc = | 19.6 | °C | Tc = | 69.6 | °C |
| TOSHIBA | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 73.5 | °C | D.F. = | 49.0 | % |
| Q116 | Tjmax= | 150 | °C | θj-c = | 6.3 | °C/W | | | |
| IPD135N03L G | Pd = | 0.01 | W | ΔTc = | 36.0 | °C | Tc = | 86.0 | °C |
| INFINEON | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 86.1 | °C | D.F. = | 57.4 | % |
| PC106 | Tjmax= | 125 | °C | θj-a = | 666.7 | °C/W | | | |
| PS2581L2-E3-A(D) | Pd = | 0.004 | W | ΔTa = | 9.0 | °C | Ta = | 59.0 | °C |
| NEC | Tj = Ta+ (θ j-a x Pd) => | | | Tj = | 61.7 | °C | D.F. = | 49.3 | % |
| PC109 | Tjmax= | 125 | °C | θj-a = | 1666.7 | °C/W | | | |
| PS2801-1-F3-A(P) | Pd = | 0.001 | W | ΔTa = | 10.0 | °C | Ta = | 59.2 | °C |
| NEC | Tj = Ta+ (θ j-a x Pd) => | | | Tj = | 60.9 | °C | D.F. = | 48.7 | % |
| PC117 | Tjmax= | 125 | °C | θj-a = | 1666.7 | °C/W | | | |
| PS2801-1-F3-A(P) | Pd = | 0.001 | W | ΔTa = | 10.0 | °C | Ta = | 59.2 | °C |
| NEC | Tj = Ta+ (θ j-a x Pd) => | | | Tj = | 60.9 | °C | D.F. = | 48.7 | % |

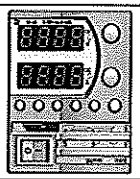
| Location No. | Vin = 200Vac | | Load=100% | Ta=50°C | | | | |
|---|---|---|---|---|---|---|---|---|
| A101 | Tjmax= | 150 | °C θj-a = | 125.0 | °C/W | | | |
| L4981AD013TR | Pd = | 0.23 | W ΔTa = | 14.0 | °C | Ta = | 64.0 | °C |
| ST | Tj = Ta + (θ j-a x Pd) => | | Tj = | 92.8 | °C | D.F. = | 61.8 | % |
| D101 | Tjmax= | 150 | °C θj-c = | 1.0 | °C/W | | | |
| D25XB60-7000 | Pd = | 2.0 | W ΔTc = | 5.7 | °C | Tc = | 55.7 | °C |
| SHINDENGEN | Tj = Tc + (θ j-c x Pd) => | | Tj = | 57.7 | °C | D.F. = | 38.5 | % |
| D106 | Tjmax= | 150 | °C θj-c = | 2.6 | °C/W | | | |
| STTH806DTI | Pd = | 0.8 | W ΔTc = | 15.4 | °C | Tc = | 65.4 | °C |
| ST | Tj = Tc + (θ j-c x Pd) => | | Tj = | 67.5 | °C | D.F. = | 45.0 | % |
| D116 | Tjmax= | 175 | °C θj-c = | 2.0 | °C/W | | | |
| IDH02SG120 | Pd = | 1.00 | W ΔTc = | 25.8 | °C | Tc = | 75.8 | °C |
| INFINEON | Tj = Tc + (θ j-c x Pd) => | | Tj = | 77.8 | °C | D.F. = | 44.5 | % |
| Q101 | Tjmax= | 150 | °C θj-c = | 0.5 | °C/W | | | |
| IPW60R190C6 | Pd = | 1.40 | W ΔTc = | 12.0 | °C | Tc = | 62.0 | °C |
| INFINEON | Tj = Tc + (θ j-c x Pd) => | | Tj = | 62.7 | °C | D.F. = | 41.8 | % |
| Q105 | Tjmax= | 150 | °C θj-c = | 0.8 | °C/W | | | |
| SPP15N60C3 | Pd = | 3.91 | W ΔTc = | 40.6 | °C | Tc = | 90.6 | °C |
| INFINEON | Tj = Tc + (θ j-c x Pd) => | | Tj = | 93.7 | °C | D.F. = | 62.5 | % |
| SC101 | Tjmax= | 125 | °C θj-c = | 1.2 | °C/W | | | |
| CR12CM-12A B00 | Pd = | 0.6 | W ΔTc = | 12.0 | °C | Tc = | 62.0 | °C |
| RENESAS | Tj = Tc + (θ j-c x Pd) => | | Tj = | 62.7 | °C | D.F. = | 50.2 | % |
| PC101 | Tjmax= | 125 | °C θj-c = | 1666.70 | °C/W | | | |
| PS2801-1-F3-A(P) | Pd = | 0.00 | W ΔTc = | 4.0 | °C | Tc = | 54.0 | °C |
| NEC | Tj = Tc + (θ j-c x Pd) => | | Tj = | 54.0 | °C | D.F. = | 43.2 | % |
| Q117 | Tjmax= | 150 | °C θj-c = | 0.61 | °C/W | | | |
| FMH09N90E | Pd = | 0.0 | W ΔTc = | 23.0 | °C | Tc = | 73.0 | °C |
| FUJI | Tj = Tc + (θ j-c x Pd) => | | Tj = | 73.0 | °C | D.F. = | 48.7 | % |

| Location No. | Vin=200Vac Load=100% Ta=50°C | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| A109 | Tjmax= | 150 | °C | θj-c = | 14.0 | °C/W | | | |
| AD7798BRUZ | Pd = | 0.002 | W | ΔTc = | 19.0 | °C | Tc = | 67.4 | °C |
| ANALOG DEVICES | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 67.4 | °C | D.F. = | 45.0 | % |
| A110 | Tjmax= | 150 | °C | θj-a = | 136.9 | °C/W | | | |
| DAC8830ICDRG4 | Pd = | 0.0001 | W | ΔTa = | 19.0 | °C | Ta = | 63.2 | °C |
| TI | Tj = Ta + (θ j-a x Pd) => | | | Tj = | 63.2 | °C | D.F. = | 42.1 | % |
| A115 | Tjmax= | 150 | °C | θj-a = | 46.0 | °C/W | | | |
| STM32F105VCT6TR | Pd = | 0.434 | W | ΔTa = | 14.0 | °C | Ta = | 59.0 | °C |
| ST | Tj = Ta + (θ j-a x Pd) => | | | Tj = | 79.0 | °C | D.F. = | 52.6 | % |
| A126 | Tjmax= | 150 | °C | θj-c = | 3.0 | °C/W | | | |
| L4941BV | Pd = | 0.2 | W | ΔTc = | 10.4 | °C | Tc = | 60.4 | °C |
| ST | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 61.0 | °C | D.F. = | 40.7 | % |
| A127 | Tjmax= | 125 | °C | θj-c = | 4.0 | °C/W | | | |
| LM3940IT-3.3NOPB | Pd = | 0.2 | W | ΔTc = | 10.6 | °C | Tc = | 60.6 | °C |
| NATIONAL | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 61.4 | °C | D.F. = | 49.1 | % |
| A141 | Tjmax= | 125 | °C | θj-a = | 180.0 | °C/W | | | |
| LM78L15ACM NOPB | Pd = | 0.1 | W | ΔTa = | 17.2 | °C | Ta = | 67.2 | °C |
| NATIONAL | Tj = Ta + (θ j-a x Pd) => | | | Tj = | 85.2 | °C | D.F. = | 68.2 | % |
| A142 | Tjmax= | 150 | °C | θj-c = | 3.0 | °C/W | | | |
| MIP2E5DMY | Pd = | 1.4 | W | ΔTc = | 18.1 | °C | Tc = | 76.8 | °C |
| MATSUSHITA | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 81.0 | °C | D.F. = | 54.0 | % |
| A145 | Tjmax= | 125 | °C | θj-a = | 231.0 | °C/W | | | |
| LM78L05ACMNOPB | Pd = | 0.08 | W | ΔTa = | 15.2 | °C | Ta = | 65.2 | °C |
| NATIONAL | Tj = Ta + (θ j-a x Pd) => | | | Tj = | 83.7 | °C | D.F. = | 67.0 | % |
| D122 | Tjmax= | 150 | °C | θj-c = | 130.0 | °C/W | | | |
| CRH01(TE85L,Q) | Pd = | 0.06 | W | ΔTc = | 15.1 | °C | Tc = | 65.1 | °C |
| TOSHIBA | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 72.9 | °C | D.F. = | 48.6 | % |
| D130 | Tjmax= | 150 | °C | θj-c = | 130.0 | °C/W | | | |
| CRH01(TE85L,Q) | Pd = | 0.03 | W | ΔTc = | 24.2 | °C | Tc = | 74.2 | °C |
| TOSHIBA | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 78.1 | °C | D.F. = | 52.1 | % |
| D136 | Tjmax= | 150 | °C | θj-c = | 130.0 | °C/W | | | |
| CRH01(TE85L,Q) | Pd = | 0.03 | W | ΔTc = | 19.6 | °C | Tc = | 69.6 | °C |
| TOSHIBA | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 73.5 | °C | D.F. = | 49.0 | % |
| Q116 | Tjmax= | 150 | °C | θj-c = | 6.3 | °C/W | | | |
| IPD135N03L G | Pd = | 0.01 | W | ΔTc = | 35.2 | °C | Tc = | 85.2 | °C |
| INFINEON | Tj = Tc + (θ j-c x Pd) => | | | Tj = | 85.3 | °C | D.F. = | 56.8 | % |
| PC106 | Tjmax= | 125 | °C | θj-a = | 666.70 | °C/W | | | |
| PS2581L2-E3-A(D) | Pd = | 0.004 | W | ΔTa = | 8.0 | °C | Ta = | 58.4 | °C |
| NEC | Tj = Ta + (θ j-a x Pd) => | | | Tj = | 61.1 | °C | D.F. = | 48.9 | % |
| PC109 | Tjmax= | 125 | °C | θj-a = | 1666.00 | °C/W | | | |
| PS2801-1-F3-A(P) | Pd = | 0.001 | W | ΔTa = | 9.0 | °C | Ta = | 59.2 | °C |
| NEC | Tj = Ta + (θ j-a x Pd) => | | | Tj = | 60.9 | °C | D.F. = | 48.7 | % |
| PC117 | Tjmax= | 125 | °C | θj-a = | 1666.00 | °C/W | | | |
| PS2801-1-F3-A(P) | Pd = | 0.001 | W | ΔTa = | 9.0 | °C | Ta = | 59.2 | °C |
| NEC | Tj = Ta + (θ j-a x Pd) => | | | Tj = | 60.9 | °C | D.F. = | 48.7 | % |

## 3. Main components temperature rise

**MODEL : 160V-1.3A**

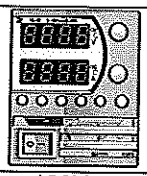
Condition:

| Standard Mounting |  |
|---|---|
| Output Voltage | 160V |
| Output Current | 1.3A |
| Ta | 50°C |

| Location No. | Parts Name | ΔT Temperature Rise (°C) | |
|---|---|---|---|
| | | 100Vac | 200Vac |
| A101 | CHIP PFC IC | 15.0 | 14.0 |
| C101 | FILM CAPACITOR | 14.0 | 8.8 |
| C102 | FILM CAPACITOR | 17.6 | 10.3 |
| C103 | CERAMIC CAPACITOR | 24.2 | 7.2 |
| C105 | FILM CAPACITOR | 20.2 | 16.2 |
| C111 | FILM CAPACITOR | 15.7 | 10.2 |
| C113 | CERAMIC CAPACITOR | 4.7 | 3.8 |
| C115 | ELEC. CAPACITOR | 14.0 | 11.3 |
| C501 | ELEC. CAPACITOR | 17.0 | 17.4 |
| D101 | BRIDGE | 30.2 | 21.8 |
| D106 | DIODE | 26.0 | 15.4 |
| D116 | DIODE | 26.4 | 25.8 |
| D117 | DIODE | 25.5 | 25.4 |
| F101 | FUSE | 24.6 | 11.4 |
| L101 | COMMON CHOKE | 31.8 | 14.2 |
| L102 | COMMON CHOKE | 22.5 | 12.8 |
| L103 | PF CHOKE | 28.9 | 28.0 |
| L104 | CHOKE | 21.1 | 20.4 |
| PC101 | OPTO COUPLER | 5.6 | 4.0 |
| PC109 | OPTO COUPLER | 10.0 | 9.0 |
| Q101 | MOSFET | 20.4 | 12.0 |
| Q105 | MOSFET | 40.4 | 40.6 |
| R500 | RES. SHUNT | 37.8 | 35.5 |
| T101 | TRANSFORMER | 31.5 | 31.1 |
| T102 | TRANSFORMER | 18.4 | 17.7 |
| T103 | TRANSFORMER | 22.2 | 21.6 |
| A108 | DIGITAL ISOLATOR | 16.8 | 15.3 |
| A115 | MICROCONTROLLER | 9.2 | 9.0 |
| A141 | LINEAR REGULATOR | 18.2 | 17.2 |
| A142 | TOP SWITCH | 27.2 | 26.8 |
| A145 | LINEAR REGULATOR | 16.2 | 15.2 |
| D125 | DIODE | 15.0 | 13.9 |
| D130 | DIODE | 25.0 | 24.5 |
| D133 | DIODE | 12.5 | 12.4 |
| T201 | TRANSFORMER | 9.8 | 9.6 |

## 4. Electrolytic capacitor lifetime

Condition:

| | |
|---|---|
| Standard Mounting |  |
| Input Voltage | 100Vac |

| | COMPUTED LIFE (year) at T(ambient) | | |
|---|---|---|---|
| **LOAD (%)** | **30°C** | **40°C** | **50°C** |
| 20 | 10.0 | 10.0 | 10.0 |
| 40 | 10.0 | 10.0 | 10.0 |
| 60 | 10.0 | 10.0 | 10.0 |
| 80 | 10.0 | 10.0 | 8.1 |
| 100 | 10.0 | 10.0 | 5.3 |

## 5. Abnormal test

**MODEL : 650V-0.32A**

**(1) Test condition and circuit:**

Input Voltage: 100Vac Output: 650V 0.32A Ta : 50°C

***(2) Test results**

| No. | Test Position | | Test Mode | | Test Result | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Location | Test point | Short | Open | 1 Fire | 2 Smoke | 3 Burst | 4 Smell | 5 Red hot | 6 Damaged | 7 Fuse open | 8 OVP | 9 OTP | 10 No output | 11 No change | 12 Others | Note |
| 1 | C115 | | • | | | | | | | | • | | | • | | | F101 |
| 2 | D101 | 1-2 | • | | | | | | | | • | | | • | | | F101 |
| | | 2-4 | • | | | | | | | | • | | | • | | | F101 |
| 3 | D104 | A-K | • | | | | | | | • | | | | | | | R123 |
| 4 | D106 | A-K | • | | | | | | | • | • | | | • | | | D103, F101, Q101 |
| 5 | D107 | A-K | • | | | | | | | | | | | | | • | Pin decreased to 283W |
| 6 | D116 | A-K | • | | | | | | | | | | | | | • | Pin decreased to 46W |
| 7 | Q101 | D-G | • | | | | | | | • | • | | | • | | | F101, Q101 |
| | | D-S | • | | | | | | | | • | | | • | | | F101 |
| | | G | | • | | | | | | • | • | | | • | | | F101, Q101 |
| 8 | Q102 | C-E | • | | | | | | | • | | | | | | | R135, R136 |
| 9 | Q104 | D-G | • | | | | | | | • | • | | | • | | | F101, Q104, Q105 |
| | | D-S | • | | | | | | | • | • | | | • | | | F101, Q104, Q106, Q107 |
| | | G | | • | | | | | | • | • | | | • | | | F101, Q104, Q105 |
| 10 | Q108 | C-E | • | | | | | | | | | | | | | • | Pin decreased to 63W |
| 11 | Q112 | C-E | • | | | | | | | | | | | • | | | |
| 12 | Q117 | D-S | • | | | | | | | • | | | • | | | | Q117, Q118, R191, R192, R193, R196 |
| | | D-G | • | | | | | | | • | | | • | | | | Q118, R191, R192, R193, R194, R196, R206 |
| 13 | R125 | | | • | | | | | | | | | | | | • | Pin increased to 508W |
| 14 | SC101 | 2 | | • | | | | | | • | • | | | • | | | F101, Q101, R123 |
| 15 | T101 | 1-3 | • | | | | | | | | | • | | • | | | |
| 1 | A126 | 1-2 | • | | | | | | | | | | | • | | | No Display, No Fan |
| 2 | A141 | 2-8 | • | | | | | | | | | | | • | | | No Display, No Fan |
| 3 | A142 | 1 | | • | | | | | | | | | | • | | | No Display, No Fan |
| | | 1-3 | • | | | | | | | • | • | | | • | | | A142, F101, ZD101 |
| | | 2-3 | • | | | | | | | | • | | | • | | | F101 |
| 4 | A143 | 3-5 | • | | | | | | | | | • | | | | | Vo: 680V, Pin: 520W, OVP fault after 4min. |
| 5 | A145 | 2-8 | • | | | | | | | • | | | | • | | | No Fan, D136 |
| 6 | D126 | A-K | • | | | | | | | | | | | • | | | No Display, No Fan |
| 7 | D123 | A-K | • | | | | | | | | | | | • | | | No Display, No Fan |
| 8 | D130 | A-K | • | | | | | | | | | | | • | | | No Display, No Fan |
| 9 | D135 | A-K | • | | | | | | | | | | | • | | | No Display, No Fan |
| 10 | D136 | A-K | • | | | | | | | | | | | • | | | No Display, No Fan |
| 1 | C500 | | • | | | | | | | • | • | | | • | | | Main fuse has blown after 4min. F101, L104, Q106, Q107 |
| 2 | C502 | | • | | | | | | | • | | | | | | | Pin decreased to 100W. L104 |
| 3 | D500 | A-K | • | | | | | | | | | | | | | • | Pin: 541W, Vo: 682.5V, Io: 0.017A |

*Z400 test results represent also Z200

## 6. Vibration test

**MODEL: 650V-0.32A**

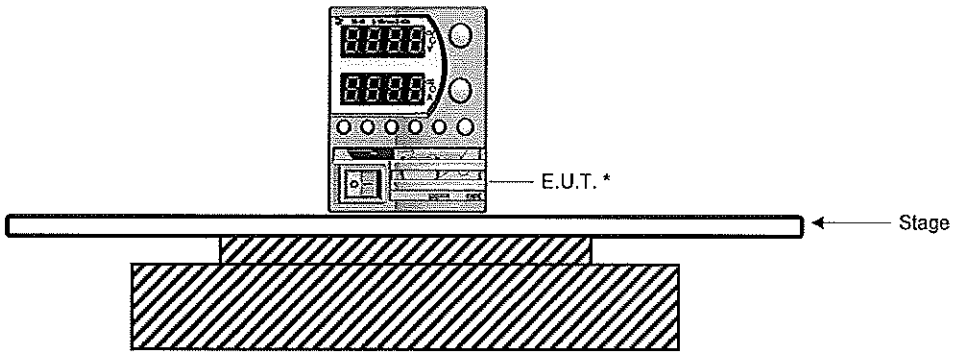
**(1) Vibration test class**

Frequency variable endurance test

**(2) Equipment used**

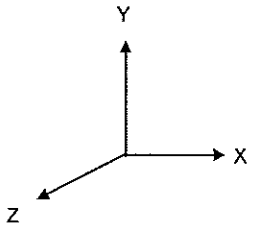
| Name | Manufacturer | Model |
|---|---|---|
| Vibration Test System | Ling Dynamic Systems | V875 |
| Laser Shaker Control System | DACTRON | LASER |
| Isotron Accelerometer 98.2 mV/g | Dytran instruments Inc. | 3256A2 |
| Isotron Accelerometer 101.7 mV/g | Dytran instruments Inc. | 3049E3 |

**(3) Testing method**




Test condition:

| | |
|---|---|
| Sweep frequency: | 5~500Hz |
| Acceleration: | 1.07G |
| Direction: | X, Y, Z |
| Test time: | 1 hour per each axis |




*E.U.T. is fixed to vibrator surface by mounting straps

***(4)Test result** **OK**

| Check item | Output Voltage (V) | Ripple (mVp-p) | E.U.T. state |
|---|---|---|---|
| Before test / Direction | 650.01 | 91.67 | O.K. |
| X | 650.02 | 110.00 | O.K. |
| Y | 650.04 | 100.33 | O.K. |
| Z | 650.04 | 96.67 | O.K. |

*Z400 test results represent also Z200

## 7. Noise Simulation Test

**MODEL : 650V-0.32A**

**(1) Test equipment:**

NoiseKen INS - 4040 impulse noise simulator
NoiseKen IJ - 4050 coupling decoupling network

**(2) Acceptance criteria:**

1. No damage to PS
2. No output shutdown
3. No other abnormalities

**(3) Test condition:**

Ta=25°C

Noise level - ± (0.6kV,1.2kV, 1.8kV, 2kV) ( 50Ω term.)

Pulse width - 50ns ~ 1us

Injection phase (AC input only) - 0°~360° (with step 45°)

Input voltage - 230Vac 50Hz

Output Current - 100%

Output Voltage - Rated

**(4) Test result:** **OK**

1. No damage to PS
2. No output shutdown
3. No other abnormalities

| Pulse | Polarity | Line-Neutral | Line-FG | Neutral-FG |
|---|---|---|---|---|
| 2kV | + | OK | | |
| 2kV | - | OK | | |
| 2kV | + | | OK | OK |
| 2kV | - | | OK | OK |

**(1) Test Equipment**

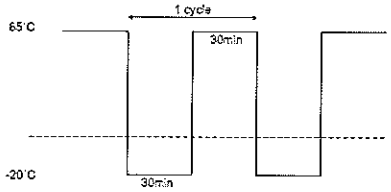
Thermal Shock Chamber: TSA-101S-W , ESPEC

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

1 (unit)

**(3) Test condition**

Ambient temperature: -20°C <=> +85°C




**(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. Later leave it for 1hour at room temperature, then check if there is no abnormal output.

***(5) Test Result** OK

Vin:100Vac

| Before testing | | | After testing | | |
|---|---|---|---|---|---|
| Vout-100%, Iout-100% | Vout-100%, Iout-0% | P-t-P | Vout-100%, Iout-100% | Vout-100%, Iout-0% | P-t-P |
| 319.962V | 319.960V | 56mV | 319.934V | 319.933V | 55mV |

*Z400 test results represent also Z200

## 9. Fan Life Expectancy

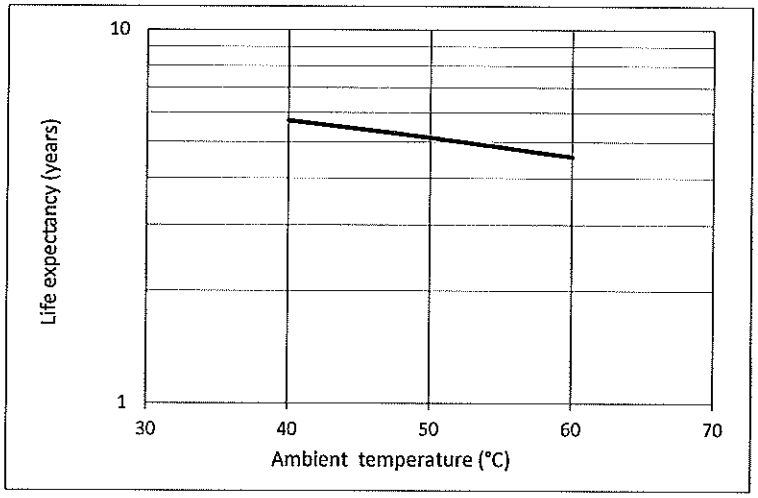
### (1) Part name

9A0612S4D041 (SANYO DENKI CO.)

### (2) Life expectancy

The data shows fan life expectancy for fan only by manufacture (90% survival rate).

Fig1. shows measuring point of ambient temperature.



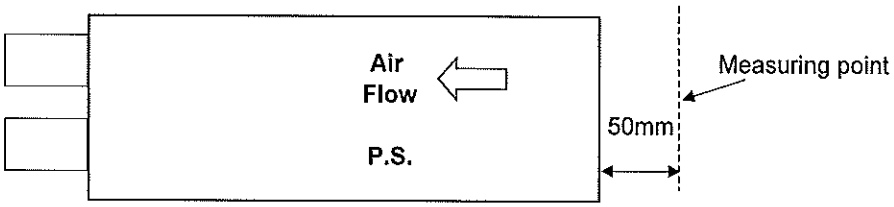




Fig1.Measuring point of fan ambient temperature.

1 year=365 day x 24 hours/day = 8760 hours