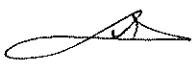



# Z<sup>+</sup>400 Series

## RELIABILITY

## DATA

DWG No.: IA710-79-01		
APPD	CHK	DWG
Dorou P. Nov-10-2011	 10/11/11	 10/11/11

**INDEX****PAGE**

1. MTBF; Calculated value of MTBF	R-1
2. Components derating	R-2~6
3. Main components temperature rise	R-7
4. Electrolytic capacitors computed life	R-8
5. Abnormal test	R-9
6. Vibration test	R-10
7. Noise simulation test	R-11
8. Thermal shock test	R-12
9. Fan life expectancy	R-13

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 : 10V-40A

### (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:

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

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 = 78569 (HOURS)**

(MTBF calculation for fan isn't included.)

## 2. Components derating

MODEL : 10V-40A

### (1) Calculation method

#### 1. Measuring Conditions

Input: 100 , 200Vac

Ambient temperature: 50°C

Output: 10V - 40A (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, Capacitors, etc.

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

#### 4. Calculation Method of Thermal Impedance:

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

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

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

$P_{c(\max)}$  : Maximum power dissipation

$T_{j(\max)}$  : Maximum junction temperature

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

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

## (2) Component derating list

Location No.	Vin=100Vac Load=100% Ta=50°C							
A101 L4981AD ST	Tjmax=	150	°C	$\theta_{j-a}$ =	120.0	°C/W		
	Pd =	0.23	W	$\Delta T_a$ =	25.0	°C	Ta =	75.0 °C
	Tj = Ta + ( $\theta_{j-a}$ x Pd) =>			Tj =	102.6	°C	D.F. =	68.4 %
D101 D25XB60-7000 SHINDENGEN	Tjmax=	150	°C	$\theta_{j-c}$ =	1.0	°C/W		
	Pd =	8	W	$\Delta T_c$ =	50.0	°C	Tc =	100.0 °C
	Tj = Tc + ( $\theta_{j-c}$ x Pd) =>			Tj =	108.0	°C	D.F. =	72.0 %
D106 STTH806DTI ST	Tjmax=	150	°C	$\theta_{j-c}$ =	2.6	°C/W		
	Pd =	3	W	$\Delta T_c$ =	31.7	°C	Tc =	81.7 °C
	Tj = Tc + ( $\theta_{j-c}$ x Pd) =>			Tj =	89.5	°C	D.F. =	59.7 %
D117 STPS30L45CT ST	Tjmax=	150	°C	$\theta_{j-c}$ =	0.85	°C/W		
	Pd =	4.8	W	$\Delta T_c$ =	40.0	°C	Tc =	90.0 °C
	Tj = Tc + ( $\theta_{j-c}$ x Pd) =>			Tj =	94.1	°C	D.F. =	62.7 %
D118 STPS30L45CT ST	Tjmax=	150	°C	$\theta_{j-c}$ =	0.85	°C/W		
	Pd =	4.8	W	$\Delta T_c$ =	46.2	°C	Tc =	96.2 °C
	Tj = Tc + ( $\theta_{j-c}$ x Pd) =>			Tj =	100.3	°C	D.F. =	66.9 %
D119 STPS30L45CT ST	Tjmax=	150	°C	$\theta_{j-c}$ =	0.85	°C/W		
	Pd =	4.8	W	$\Delta T_c$ =	37.6	°C	Tc =	87.6 °C
	Tj = Tc + ( $\theta_{j-c}$ x Pd) =>			Tj =	91.7	°C	D.F. =	61.1 %
D120 STPS30L45CT ST	Tjmax=	150	°C	$\theta_{j-c}$ =	0.85	°C/W		
	Pd =	4.8	W	$\Delta T_c$ =	40.7	°C	Tc =	90.7 °C
	Tj = Tc + ( $\theta_{j-c}$ x Pd) =>			Tj =	94.8	°C	D.F. =	63.2 %
Q101 IPW60R099CP INFINEON	Tjmax=	150	°C	$\theta_{j-c}$ =	0.5	°C/W		
	Pd =	8.6	W	$\Delta T_c$ =	35.2	°C	Tc =	85.2 °C
	Tj = Tc + ( $\theta_{j-c}$ x Pd) =>			Tj =	89.5	°C	D.F. =	59.7 %
Q104 SPP15N60C3 INFINEON	Tjmax=	150	°C	$\theta_{j-c}$ =	0.8	°C/W		
	Pd =	7.24	W	$\Delta T_c$ =	37.7	°C	Tc =	87.7 °C
	Tj = Tc + ( $\theta_{j-c}$ x Pd) =>			Tj =	93.5	°C	D.F. =	62.3 %
Q105 SPP15N60C3 INFINEON	Tjmax=	150	°C	$\theta_{j-c}$ =	0.8	°C/W		
	Pd =	5.12	W	$\Delta T_c$ =	37.5	°C	Tc =	87.5 °C
	Tj = Tc + ( $\theta_{j-c}$ x Pd) =>			Tj =	91.6	°C	D.F. =	61.1 %
Q106 SPP15N60C3 INFINEON	Tjmax=	150	°C	$\theta_{j-c}$ =	0.8	°C/W		
	Pd =	6.5	W	$\Delta T_c$ =	38.1	°C	Tc =	88.1 °C
	Tj = Tc + ( $\theta_{j-c}$ x Pd) =>			Tj =	93.3	°C	D.F. =	62.2 %
Q107 SPP15N60C3 INFINEON	Tjmax=	150	°C	$\theta_{j-c}$ =	0.8	°C/W		
	Pd =	6.6	W	$\Delta T_c$ =	30.6	°C	Tc =	80.6 °C
	Tj = Tc + ( $\theta_{j-c}$ x Pd) =>			Tj =	85.9	°C	D.F. =	57.3 %
SC101 CR12CM-12A B00 RENESAS	Tjmax=	125	°C	$\theta_{j-c}$ =	1.20	°C/W		
	Pd =	2	W	$\Delta T_c$ =	21.4	°C	Tc =	71.4 °C
	Tj = Tc + ( $\theta_{j-c}$ x Pd) =>			Tj =	73.8	°C	D.F. =	59.0 %
Q118 TK20A25D TOSHIBA	Tjmax=	150	°C	$\theta_{j-c}$ =	2.78	°C/W		
	Pd =	2.7	W	$\Delta T_c$ =	34.6	°C	Tc =	84.6 °C
	Tj = Tc + ( $\theta_{j-c}$ x Pd) =>			Tj =	92.1	°C	D.F. =	61.4 %
PC101 PS2801-1-F3-A(P) NEC	Tjmax=	125	°C	$\theta_{j-c}$ =	1666.00	°C/W		
	Pd =	0.001	W	$\Delta T_a$ =	31.4	°C	Ta =	81.4 °C
	Tj = Tc + ( $\theta_{j-c}$ x Pd) =>			Tj =	83.1	°C	D.F. =	66.5 %

Location No.	Vin=100Vac Load=100% Ta=50°C						
A109 AD7798BRUZ NATIONAL	Tjmax=	150	°C	$\theta$ -a =	180.0	°C/W	
	Pd =	0.002	W	$\Delta$ Ta =	20.0	°C	Ta = 70.0 °C
	Tj = Ta + ( $\theta$ j-a x Pd) =>			Tj =	70.4	°C	D.F. = 46.9 %
A110 DAC8830ICDRG4 TI	Tjmax=	150	°C	$\theta$ -a =	136.9	°C/W	
	Pd =	0.0001	W	$\Delta$ Ta =	20.0	°C	Ta = 70.0 °C
	Tj = Ta + ( $\theta$ j-a x Pd) =>			Tj =	70.0	°C	D.F. = 46.7 %
A115 STM32F105VCT6TR ST	Tjmax=	150	°C	$\theta$ -a =	46.0	°C/W	
	Pd =	0.434	W	$\Delta$ Ta =	15.0	°C	Ta = 65.0 °C
	Tj = Ta + ( $\theta$ j-a x Pd) =>			Tj =	85.0	°C	D.F. = 56.6 %
A141 LM78L15ACM NOPB NATIONAL	Tjmax=	125	°C	$\theta$ -a =	180.0	°C/W	
	Pd =	0.1	W	$\Delta$ Ta =	18.0	°C	Ta = 68.0 °C
	Tj = Ta + ( $\theta$ j-a x Pd) =>			Tj =	86.0	°C	D.F. = 68.8 %
A142 MIP2E4DMY MATSUSHITA	Tjmax=	150	°C	$\theta$ -c =	3.0	°C/W	
	Pd =	1.4	W	$\Delta$ Tc =	19.4	°C	Tc = 69.4 °C
	Tj = Tc + ( $\theta$ j-c x Pd) =>			Tj =	73.6	°C	D.F. = 49.1 %
A145 LM78L05ACMNOPB NATIONAL	Tjmax=	125	°C	$\theta$ -a =	231.0	°C/W	
	Pd =	0.08	W	$\Delta$ Ta =	18.0	°C	Ta = 68.0 °C
	Tj = Tc + ( $\theta$ j-c x Pd) =>			Tj =	86.5	°C	D.F. = 69.2 %
A148 LM3940IT-3.3NOPB NATIONAL	Tjmax=	125	°C	$\theta$ -c =	4.0	°C/W	
	Pd =	0.5	W	$\Delta$ Tc =	11.7	°C	Tc = 61.7 °C
	Tj = Tc + ( $\theta$ j-c x Pd) =>			Tj =	63.7	°C	D.F. = 51.0 %
A149 L4941BV ST	Tjmax=	150	°C	$\theta$ -c =	3.0	°C/W	
	Pd =	0.6	W	$\Delta$ Tc =	10.4	°C	Tc = 60.4 °C
	Tj = Tc + ( $\theta$ j-c x Pd) =>			Tj =	62.2	°C	D.F. = 41.5 %
D122 CRH01(TE85L,Q) TOSHIBA	Tjmax=	150	°C	$\theta$ -c =	130.0	°C/W	
	Pd =	0.06	W	$\Delta$ Tc =	24.7	°C	Tc = 74.7 °C
	Tj = Tc + ( $\theta$ j-c x Pd) =>			Tj =	82.5	°C	D.F. = 55.0 %
D130 CRH01(TE85L,Q) TOSHIBA	Tjmax=	150	°C	$\theta$ -c =	130.0	°C/W	
	Pd =	0.03	W	$\Delta$ Tc =	25.0	°C	Tc = 75.0 °C
	Tj = Tc + ( $\theta$ j-c x Pd) =>			Tj =	78.9	°C	D.F. = 52.6 %
D136 CRH01(TE85L,Q) TOSHIBA	Tjmax=	150	°C	$\theta$ -c =	130.0	°C/W	
	Pd =	0.03	W	$\Delta$ Tc =	19.6	°C	Tc = 69.6 °C
	Tj = Tc + ( $\theta$ j-c x Pd) =>			Tj =	73.5	°C	D.F. = 49.0 %
Q129 2SK4033 TOSHIBA	Tjmax=	150	°C	$\theta$ -c =	6.3	°C/W	
	Pd =	0.01	W	$\Delta$ Tc =	32.2	°C	Tc = 82.2 °C
	Tj = Tc + ( $\theta$ j-c x Pd) =>			Tj =	82.3	°C	D.F. = 54.8 %
Q129 2SK4033 TOSHIBA	Tjmax=	150	°C	$\theta$ -c =	6.3	°C/W	
	Pd =	0.01	W	$\Delta$ Tc =	32.2	°C	Tc = 82.2 °C
	Tj = Tc + ( $\theta$ j-c x Pd) =>			Tj =	82.3	°C	D.F. = 54.8 %
PC106 PS2581L2-E3-A(D) NEC	Tjmax=	125	°C	$\theta$ -c =	666.00	°C/W	
	Pd =	0.004	W	$\Delta$ Tc =	9.0	°C	Ta = 59.0 °C
	Tj = Tc + ( $\theta$ j-c x Pd) =>			Tj =	61.7	°C	D.F. = 49.3 %
PC117 PS2801-1-F3-A(P) NEC	Tjmax=	125	°C	$\theta$ -c =	1666.00	°C/W	
	Pd =	0.001	W	$\Delta$ Ta =	10.0	°C	Ta = 60.0 °C
	Tj = Tc + ( $\theta$ j-c x Pd) =>			Tj =	61.7	°C	D.F. = 49.3 %
PC118 PS2801-1-F3-A(P) NEC	Tjmax=	125	°C	$\theta$ -c =	1666.00	°C/W	
	Pd =	0.001	W	$\Delta$ Ta =	10.0	°C	Ta = 60.0 °C
	Tj = Tc + ( $\theta$ j-c x Pd) =>			Tj =	61.7	°C	D.F. = 49.3 %

## (2) Component Derating list

Location No.	Vin=200Vac Load=100% Ta=50°C							
A101 L4981AD ST	Tjmax=	150	°C	θj-a =	120.0	°C/W		
	Pd =	0.23	W	ΔTa =	24.2	°C	Ta =	74.2 °C
	Tj = Ta + (θ j-a x Pd) =>			Tj =	101.8	°C	D.F. =	67.9 %
D101 D25XB60-7000 SHINDENGEN	Tjmax=	150	°C	θj-c =	1.0	°C/W		
	Pd =	4	W	ΔTc =	30.4	°C	Tc =	80.4 °C
	Tj = Tc + (θ j-c x Pd) =>			Tj =	84.4	°C	D.F. =	56.3 %
D106 STTH806DTI ST	Tjmax=	150	°C	θj-c =	2.6	°C/W		
	Pd =	0.6	W	ΔTc =	22.4	°C	Tc =	72.4 °C
	Tj = Tc + (θ j-c x Pd) =>			Tj =	74.0	°C	D.F. =	49.3 %
D117 STPS30L45CT ST	Tjmax=	150	°C	θj-c =	0.85	°C/W		
	Pd =	4.8	W	ΔTc =	37.7	°C	Tc =	87.7 °C
	Tj = Tc + (θ j-c x Pd) =>			Tj =	91.8	°C	D.F. =	61.2 %
D118 STPS30L45CT ST	Tjmax=	150	°C	θj-c =	0.85	°C/W		
	Pd =	4.8	W	ΔTc =	45.0	°C	Tc =	95.0 °C
	Tj = Tc + (θ j-c x Pd) =>			Tj =	99.1	°C	D.F. =	66.1 %
D119 STPS30L45CT ST	Tjmax=	150	°C	θj-c =	0.85	°C/W		
	Pd =	4.8	W	ΔTc =	35.7	°C	Tc =	85.7 °C
	Tj = Tc + (θ j-c x Pd) =>			Tj =	89.8	°C	D.F. =	59.9 %
D120 STPS30L45CT ST	Tjmax=	150	°C	θj-c =	0.85	°C/W		
	Pd =	4.8	W	ΔTc =	38.7	°C	Tc =	88.7 °C
	Tj = Tc + (θ j-c x Pd) =>			Tj =	92.8	°C	D.F. =	61.9 %
Q101 IPW60R099CP INFINEON	Tjmax=	150	°C	θj-c =	0.5	°C/W		
	Pd =	4	W	ΔTc =	20.1	°C	Tc =	70.1 °C
	Tj = Tc + (θ j-c x Pd) =>			Tj =	72.1	°C	D.F. =	48.1 %
Q104 SPP15N60C3 INFINEON	Tjmax=	150	°C	θj-c =	0.8	°C/W		
	Pd =	7.24	W	ΔTc =	37.2	°C	Tc =	87.2 °C
	Tj = Tc + (θ j-c x Pd) =>			Tj =	93.0	°C	D.F. =	62.0 %
Q105 SPP15N60C3 INFINEON	Tjmax=	150	°C	θj-c =	0.8	°C/W		
	Pd =	5.12	W	ΔTc =	37.1	°C	Tc =	87.1 °C
	Tj = Tc + (θ j-c x Pd) =>			Tj =	91.2	°C	D.F. =	60.8 %
Q106 SPP15N60C3 INFINEON	Tjmax=	150	°C	θj-c =	0.8	°C/W		
	Pd =	6.5	W	ΔTc =	37.7	°C	Tc =	87.7 °C
	Tj = Tc + (θ j-c x Pd) =>			Tj =	92.9	°C	D.F. =	61.9 %
Q107 SPP15N60C3 INFINEON	Tjmax=	150	°C	θj-c =	0.8	°C/W		
	Pd =	6.6	W	ΔTc =	30.2	°C	Tc =	80.2 °C
	Tj = Tc + (θ j-c x Pd) =>			Tj =	85.5	°C	D.F. =	57.0 %
SC101 CR12CM-12A B00 RENESAS	Tjmax=	125	°C	θj-c =	1.20	°C/W		
	Pd =	1	W	ΔTc =	15.3	°C	Tc =	65.3 °C
	Tj = Tc + (θ j-c x Pd) =>			Tj =	66.5	°C	D.F. =	53.2 %
Q118 TK20A25D TOSHIBA	Tjmax=	150	°C	θj-c =	2.78	°C/W		
	Pd =	2.7	W	ΔTc =	32.7	°C	Tc =	82.7 °C
	Tj = Tc + (θ j-c x Pd) =>			Tj =	90.2	°C	D.F. =	60.1 %
PC101 PS2801-1-F3-A(P) NEC	Tjmax=	125	°C	θj-c =	1666.00	°C/W		
	Pd =	0.001	W	ΔTa =	30.4	°C	Ta =	80.4 °C
	Tj = Tc + (θ j-c x Pd) =>			Tj =	82.1	°C	D.F. =	65.7 %

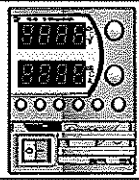
Location No.	Vin=200Vac Load=100% Ta=50°C								
A109 AD7798BRUZ NATIONAL	Tjmax= Pd = Tj = Ta + (θ j-a x Pd) =>	150 0.002 W	°C W °C	θj-a = ΔTa = Tj =	180.0 19.0 69.4	°C/W °C °C	Ta = D.F. =	69.0 46.2	°C %
A110 DAC8830ICDRG4 TI	Tjmax= Pd = Tj = Ta + (θ j-a x Pd) =>	150 0.0001 W	°C W °C	θj-a = ΔTa = Tj =	136.9 19.0 69.0	°C/W °C °C	Ta = D.F. =	69.0 46.0	°C %
A115 STM32F105VCT6TR ST	Tjmax= Pd = Tj = Ta + (θ j-a x Pd) =>	150 0.434 W	°C W °C	θj-a = ΔTa = Tj =	46.0 14.0 84.0	°C/W °C °C	Ta = D.F. =	64.0 56.0	°C %
A141 LM78L15ACM NOPB NATIONAL	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	125 0.1 W	°C W °C	θj-a = ΔTa = Tj =	180.0 17.0 85.0	°C/W °C °C	Ta = D.F. =	67.0 68.0	°C %
A142 MIP2E4DMY MATSUSHITA	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 1.4 W	°C W °C	θj-c = ΔTc = Tj =	3.0 18.1 72.3	°C/W °C °C	Tc = D.F. =	68.1 48.2	°C %
A145 LM78L05ACMNOPB NATIONAL	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	125 0.08 W	°C W °C	θj-a = ΔTa = Tj =	231.0 17.0 85.5	°C/W °C °C	Ta = D.F. =	67.0 68.4	°C %
A148 LM3940IT-3.3NOPB NATIONAL	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	125 0.2 W	°C W °C	θj-c = ΔTc = Tj =	4.0 11.4 62.2	°C/W °C °C	Tc = D.F. =	61.4 49.8	°C %
A149 L4941BV ST	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.2 W	°C W °C	θj-c = ΔTc = Tj =	3.0 10.0 60.6	°C/W °C °C	Tc = D.F. =	60.0 40.4	°C %
D122 CRH01(TE85L,Q) TOSHIBA	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.06 W	°C W °C	θj-c = ΔTc = Tj =	130.0 24.3 82.1	°C/W °C °C	Tc = D.F. =	74.3 54.7	°C %
D130 CRH01(TE85L,Q) TOSHIBA	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.03 W	°C W °C	θj-c = ΔTc = Tj =	130.0 24.5 78.4	°C/W °C °C	Tc = D.F. =	74.5 52.3	°C %
D136 CRH01(TE85L,Q) TOSHIBA	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.03 W	°C W °C	θj-c = ΔTc = Tj =	130.0 19.0 72.9	°C/W °C °C	Tc = D.F. =	69.0 48.6	°C %
Q129 2SK4033 TOSHIBA	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.01 W	°C W °C	θj-c = ΔTc = Tj =	6.3 31.3 81.4	°C/W °C °C	Tc = D.F. =	81.3 54.2	°C %
PC106 PS2581L2-E3-A(D) NEC	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	125 0.004 W	°C W °C	θj-c = ΔTa = Tj =	666.00 8.0 60.7	°C/W °C °C	Ta = D.F. =	58.0 48.5	°C %
PC117 PS2801-1-F3-A(P) NEC	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	125 0.001 W	°C W °C	θj-c = ΔTa = Tj =	1666.00 9.0 60.7	°C/W °C °C	Ta = D.F. =	59.0 48.5	°C %
PC118 PS2801-1-F3-A(P) NEC	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	125 0.001 W	°C W °C	θj-c = ΔTa = Tj =	1666.00 9.0 60.7	°C/W °C °C	Ta = D.F. =	59.0 48.5	°C %



## 3. Main components temperature rise

MODEL : 10V-40A

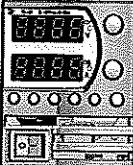
Condition:

Standard Mounting	
Output Voltage	10V
Output Current	40A
Ta	50°C

Location No.	Parts Name	$\Delta T$ Temperature Rise (°C)	
		100Vac	200Vac
A101	CHIP PFC IC	25.0	24.2
C101	FILM CAPACITOR	27.2	18.3
C102	FILM CAPACITOR	28.2	18.6
C103	CERAMIC CAPACITOR	19.4	19.3
C105	FILM CAPACITOR	25.2	21.0
C111	FILM CAPACITOR	10.7	9.6
C113	CERAMIC CAPACITOR	4.2	4.5
C115	ELEC. CAPACITOR	15.2	13.2
C116	ELEC. CAPACITOR	9.3	8.4
C140	FILM CAPACITOR	36.4	36.2
C147	ELEC. CAPACITOR	27.7	24.0
D101	BRIDGE	50.0	30.4
D106	DIODE	31.7	22.4
D117	DIODE	40.0	37.7
D118	DIODE	46.2	45.0
D120	DIODE	40.7	38.7
F101	FUSE	33.1	18.7
L101	COMMON CHOKE	33.3	18.8
L102	COMMON CHOKE	39.3	22.3
L103	PF CHOKE	55.4	52.5
L104	CHOKE	50.2	46.0
PC101	OPTO COUPLER	31.4	30.4
PC118	OPTO COUPLER	10.0	9.0
Q101	MOSFET	35.2	20.1
Q106	MOSFET	38.1	37.7
R199	RES. SHUNT	37.3	33.7
T101	TRANSFORMER	64.9	63.0
T102	TRANSFORMER	15.5	16.2
T103	TRANSFORMER	21.6	21.3
A107	DIGITAL ISOLATOR	15.5	15.0
A115	MICROCONTROLLER	15.0	13.5
A141	LINEAR REGULATOR	18.0	17.0
A142	TOP SWITCH	19.4	18.1
A145	LINEAR REGULATOR	18.0	17.0
D125	DIODE	13.0	12.4
D130	DIODE	24.9	24.5
D133	DIODE	19.7	19.3
T201	TRANSFORMER	24.0	23.6
ZD116	ZENER	30.0	28.5
ZD123	ZENER	28.7	26.8

4. Electrolytic capacitor lifetime

Condition:

Standard Mounting	
Input Voltage	100Vac

		COMPUTED LIFE (year) at T(ambient)		
LOAD (%)	30°C	40°C	50°C	
20	15.0	15.0	12.2	
40	15.0	15.0	10.6	
60	15.0	15.0	9.9	
80	15.0	15.0	8.0	
100	15.0	10.6	5.3	

5. Abnormal test

MODEL : 10V-40A

(1) Test condition and circuit:

Input Voltage: 100Vac

Output: 10V 40A

Ta : 50°C

(2) Test results

No.	Test Position		Test Mode		Test Result													
	Location	Test point	Short	Open	1	2	3	4	5	6	7	8	9	10	11	12	Note	
					Fire	Smoke	Burst	Smell	Red hot	Damaged	Fuse open	OVP	OTP	No output	No change	Others		
1	Q101	D-S	•											•			F101 opened	
		G-S	•							•				•			R112,R111,R135,R136 - damaged	
		D-G	•							•	•			•			F101 opened, Q102, A101, ZD101, R111, R112 - damaged	
		D		•											•			
		S		•											•			
2	D106	A-K	•							•	•						F101 opened, Q101 damaged	
		A		•										•				
3	D115	A-K	•												•			
		A		•											•			
4	D103	A-K	•							•	•			•			F101 opened, Q101 damaged	
		A		•											•			
5	D101	1-3	•								•			•			F101 opened	
		2-4	•								•			•			F101 opened	
6	C116		•							•	•			•			F101 opened, Q101 damaged	
				•											•			
7	Q102	E-C	•							•				•			R135, R136 - damaged;	
		B-E	•							•				•			R135, R136 - damaged;	
8	D118	A-K	•												•		Pin=35W, Iin=0.2A. PS functional normally after removing short	
		A		•											•			
9	Q106	D-S	•							•	•			•			F101 opened; R123, R176, Q104, Q105, Q107 - damaged	
		G-S	•							•	•			•			F101 opened; R123, R176, Q104, Q105, Q107, Q110 - damaged	
		D-G	•											•		•	Pin=30W, Iin=0.14A. P.S functional normally after removing short	
		D		•						•	•			•			F101 opened; Q105,Q107 - damaged	
		S		•						•	•			•			F101 opened; Q105,Q107 - damaged	
10	C148		•													•	P.S in CC mode output unstable	
				•													•	P.S functional normally after removing short and AC recycled
11	T101	5-6	•							•				•			Q104~Q107, R123, R181, R182 - damaged	
		2-7	•							•				•			Q104~Q107, R123, R181, R182 - damaged	
12	L104		•							•				•			R123 - damaged	
13	SC101	A		•										•			R123 damaged	
		K		•										•			R123 damaged	
		G		•										•			R123 damaged	
		A - K	•											•			•	Fuse opened
		A - G	•											•				R123 damaged
		K - G	•											•				R123 damaged
14	PC101	A-K	•												•			
		C-E	•	•									•	•			OTP	
15	PC106	A-K	•											•				
		C-E	•	•									•	•				
16	PC109	A-K	•											•				
		C-E	•	•							•		•	•				
17	PC116	A-K	•											•				
		C-E	•	•									•	•				
18	PC118	A-K	•											•				
		C-E	•	•									•	•				
19	PC119	A-K	•											•				
		C-E	•	•									•	•				

6. Vibration test

MODEL: 10V-40A

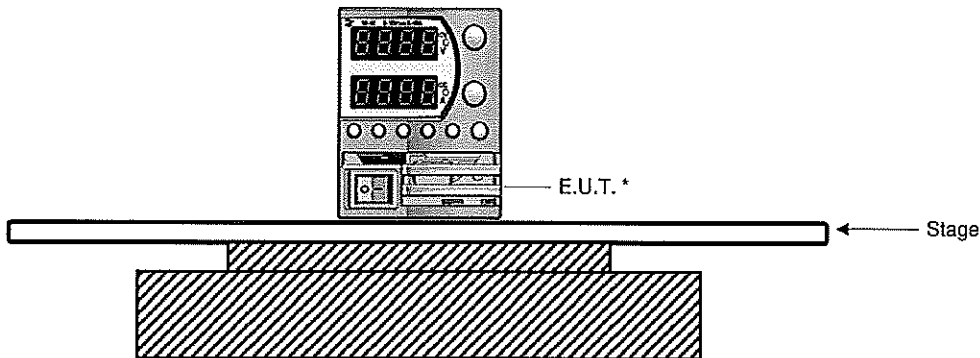
(1) Vibration test class

Frequency variable endurance test

(2) Equipment used

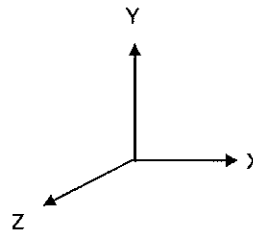
Name	Manufacturer	Model
Vibration Test System	Ling Dynamic Systems	V875
Laser Shaker Control System	DACTRON	LASER
Isotron Accelerometer 98.2 mV/g	Dytran instruments Inc.	3256A2
Isotron Accelerometer 101.7 mV/g	Dytran instruments Inc.	3049E3

(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	10.00	40.00	O.K.
Direction			
X	10.00	39.16	O.K.
Y	10.00	41.28	O.K.
Z	10.00	40.00	O.K.

## 7. Noise Simulation Test

MODEL : 60V-7A

### (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-  $\pm$  (0.6kV, 1.2kV, 1.8kV, 2kV) ( 50 $\Omega$  term.)

Pulse width- 50ns ~ 1us

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

Input voltage - 230Vac

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

8. Thermal Shock Test

(1) Test Equipment

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

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

1 (unit)

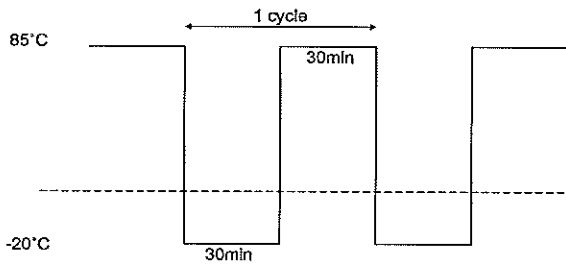
(3) Test condition

Ambient temperature: -20°C <=> +85°C

Test time: Refer to Dwg.

Test cycle: 100cycles

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. Later leave it for 1 hour 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
36.000V	36.002V	25mV	35.999V	36.000V	23mV

### 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.

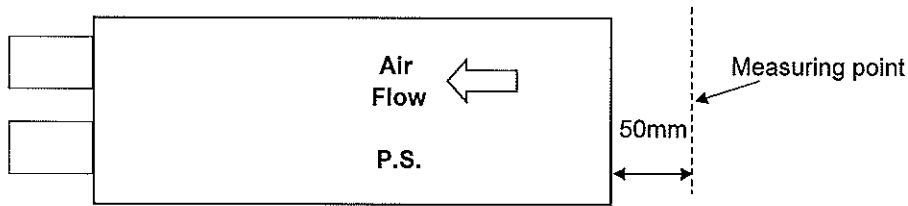
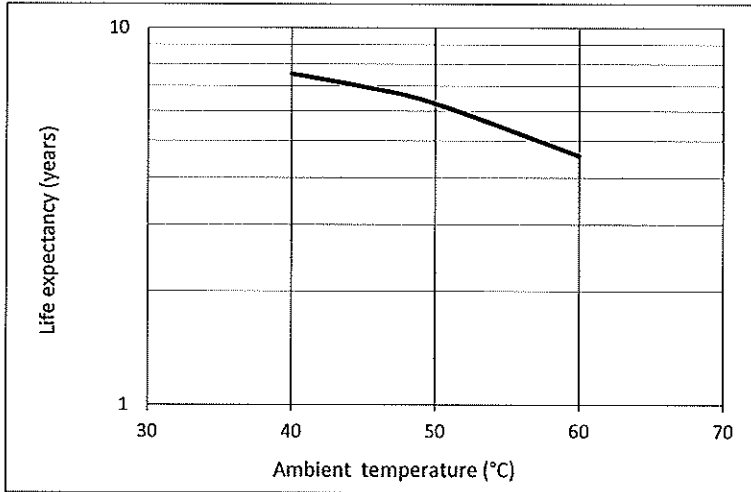


Fig1.Measuring point of fan ambient temperature.

$$1 \text{ year} = 365 \text{ day} \times 24 \text{ hours/day} = 8760 \text{ hours}$$

