Z+400 Series

RELIABILITY DATA

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

TDK-Lambda

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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:

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

Where:

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

λ_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

π_Q = Generic Quality factor for the i th Generic Part (π_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℃

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, 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℃ in general

Ta : Ambient temperature at start point of derating; 25℃ in General

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

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

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

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

(2) Component derating list

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

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

(2) Component Derating list

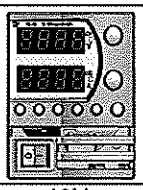
Location No.	Vin=200Vac Load=100% Ta=50°C								
A101	Tjmax=	150	°C	θj-a =	120.0	°C/W			
L4981AD	Pd =	0.23	W	ΔTa =	24.2	°C	Ta =	74.2	°C
ST	Tj = Ta + (θ j-a x Pd) =>			Tj =	101.8	°C	D.F. =	67.9	%
D101	Tjmax=	150	°C	θj-c =	1.0	°C/W			
D25XB60-7000	Pd =	4	W	ΔTc =	30.4	°C	Tc =	80.4	°C
SHINDENGEN	Tj = Tc + (θ j-c x Pd) =>			Tj =	84.4	°C	D.F. =	56.3	%
D106	Tjmax=	150	°C	θj-c =	2.6	°C/W			
STTH806DTI	Pd =	0.6	W	ΔTc =	22.4	°C	Tc =	72.4	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	74.0	°C	D.F. =	49.3	%
D117	Tjmax=	150	°C	θj-c =	0.85	°C/W			
STPS30L45CT	Pd =	4.8	W	ΔTc =	37.7	°C	Tc =	87.7	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	91.8	°C	D.F. =	61.2	%
D118	Tjmax=	150	°C	θj-c =	0.85	°C/W			
STPS30L45CT	Pd =	4.8	W	ΔTc =	45.0	°C	Tc =	95.0	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	99.1	°C	D.F. =	66.1	%
D119	Tjmax=	150	°C	θj-c =	0.85	°C/W			
STPS30L45CT	Pd =	4.8	W	ΔTc =	35.7	°C	Tc =	85.7	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	89.8	°C	D.F. =	59.9	%
D120	Tjmax=	150	°C	θj-c =	0.85	°C/W			
STPS30L45CT	Pd =	4.8	W	ΔTc =	38.7	°C	Tc =	88.7	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	92.8	°C	D.F. =	61.9	%
Q101	Tjmax=	150	°C	θj-c =	0.5	°C/W			
IPW60R099CP	Pd =	4	W	ΔTc =	20.1	°C	Tc =	70.1	°C
INFINEON	Tj = Tc + (θ j-c x Pd) =>			Tj =	72.1	°C	D.F. =	48.1	%
Q104	Tjmax=	150	°C	θj-c =	0.8	°C/W			
SPP15N60C3	Pd =	7.24	W	ΔTc =	37.2	°C	Tc =	87.2	°C
INFINEON	Tj = Tc + (θ j-c x Pd) =>			Tj =	93.0	°C	D.F. =	62.0	%
Q105	Tjmax=	150	°C	θj-c =	0.8	°C/W			
SPP15N60C3	Pd =	5.12	W	ΔTc =	37.1	°C	Tc =	87.1	°C
INFINEON	Tj = Tc + (θ j-c x Pd) =>			Tj =	91.2	°C	D.F. =	60.8	%
Q106	Tjmax=	150	°C	θj-c =	0.8	°C/W			
SPP15N60C3	Pd =	6.5	W	ΔTc =	37.7	°C	Tc =	87.7	°C
INFINEON	Tj = Tc + (θ j-c x Pd) =>			Tj =	92.9	°C	D.F. =	61.9	%
Q107	Tjmax=	150	°C	θj-c =	0.8	°C/W			
SPP15N60C3	Pd =	6.6	W	ΔTc =	30.2	°C	Tc =	80.2	°C
INFINEON	Tj = Tc + (θ j-c x Pd) =>			Tj =	85.5	°C	D.F. =	57.0	%
SC101	Tjmax=	125	°C	θj-c =	1.20	°C/W			
CR12CM-12A B00	Pd =	1	W	ΔTc =	15.3	°C	Tc =	65.3	°C
RENESAS	Tj = Tc + (θ j-c x Pd) =>			Tj =	66.5	°C	D.F. =	53.2	%
Q118	Tjmax=	150	°C	θj-c =	2.78	°C/W			
TK20A25D	Pd =	2.7	W	ΔTc =	32.7	°C	Tc =	82.7	°C
TOSHIBA	Tj = Tc + (θ j-c x Pd) =>			Tj =	90.2	°C	D.F. =	60.1	%
PC101	Tjmax=	125	°C	θj-c =	1666.00	°C/W			
PS2801-1-F3-A(P)	Pd =	0.001	W	ΔTa =	30.4	°C	Ta =	80.4	°C
NEC	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	Tjmax=	150	℃	θj-a =	180.0	℃/W			
AD7798BRUZ	Pd =	0.002	W	ΔTa =	19.0	℃	Ta =	69.0	℃
NATIONAL	Tj = Ta + (θ j-a x Pd) =>			Tj =	69.4	℃	D.F. =	46.2	%
A110	Tjmax=	150	℃	θj-a =	136.9	℃/W			
DAC8830ICDRG4	Pd =	0.0001	W	ΔTa =	19.0	℃	Ta =	69.0	℃
TI	Tj = Ta + (θ j-a x Pd) =>			Tj =	69.0	℃	D.F. =	46.0	%
A115	Tjmax=	150	℃	θj-a =	46.0	℃/W			
STM32F105VCT6TR	Pd =	0.434	W	ΔTa =	14.0	℃	Ta =	64.0	℃
ST	Tj = Ta + (θ j-a x Pd) =>			Tj =	84.0	℃	D.F. =	56.0	%
A141	Tjmax=	125	℃	θj-a =	180.0	℃/W			
LM78L15ACM NOPB	Pd =	0.1	W	ΔTa =	17.0	℃	Ta =	67.0	℃
NATIONAL	Tj = Tc + (θ j-c x Pd) =>			Tj =	85.0	℃	D.F. =	68.0	%
A142	Tjmax=	150	℃	θj-c =	3.0	℃/W			
MIP2E4DMY	Pd =	1.4	W	ΔTc =	18.1	℃	Tc =	68.1	℃
MATSUSHITA	Tj = Tc + (θ j-c x Pd) =>			Tj =	72.3	℃	D.F. =	48.2	%
A145	Tjmax=	125	℃	θj-a =	231.0	℃/W			
LM78L05ACMNOPB	Pd =	0.08	W	ΔTa =	17.0	℃	Ta =	67.0	℃
NATIONAL	Tj = Tc + (θ j-c x Pd) =>			Tj =	85.5	℃	D.F. =	68.4	%
A148	Tjmax=	125	℃	θj-c =	4.0	℃/W			
LM3940IT-3.3NOPB	Pd =	0.2	W	ΔTc =	11.4	℃	Tc =	61.4	℃
NATIONAL	Tj = Tc + (θ j-c x Pd) =>			Tj =	62.2	℃	D.F. =	49.8	%
A149	Tjmax=	150	℃	θj-c =	3.0	℃/W			
L4941BV	Pd =	0.2	W	ΔTc =	10.0	℃	Tc =	60.0	℃
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	60.6	℃	D.F. =	40.4	%
D122	Tjmax=	150	℃	θj-c =	130.0	℃/W			
CRH01(TE85L,Q)	Pd =	0.06	W	ΔTc =	24.3	℃	Tc =	74.3	℃
TOSHIBA	Tj = Tc + (θ j-c x Pd) =>			Tj =	82.1	℃	D.F. =	54.7	%
D130	Tjmax=	150	℃	θj-c =	130.0	℃/W			
CRH01(TE85L,Q)	Pd =	0.03	W	ΔTc =	24.5	℃	Tc =	74.5	℃
TOSHIBA	Tj = Tc + (θ j-c x Pd) =>			Tj =	78.4	℃	D.F. =	52.3	%
D136	Tjmax=	150	℃	θj-c =	130.0	℃/W			
CRH01(TE85L,Q)	Pd =	0.03	W	ΔTc =	19.0	℃	Tc =	69.0	℃
TOSHIBA	Tj = Tc + (θ j-c x Pd) =>			Tj =	72.9	℃	D.F. =	48.6	%
Q129	Tjmax=	150	℃	θj-c =	6.3	℃/W			
2SK4033	Pd =	0.01	W	ΔTc =	31.3	℃	Tc =	81.3	℃
TOSHIBA	Tj = Tc + (θ j-c x Pd) =>			Tj =	81.4	℃	D.F. =	54.2	%
PC106	Tjmax=	125	℃	θj-c =	666.00	℃/W			
PS2581L2-E3-A(D)	Pd =	0.004	W	ΔTa =	8.0	℃	Ta =	58.0	℃
NEC	Tj = Tc + (θ j-c x Pd) =>			Tj =	60.7	℃	D.F. =	48.5	%
PC117	Tjmax=	125	℃	θj-c =	1666.00	℃/W			
PS2801-1-F3-A(P)	Pd =	0.001	W	ΔTa =	9.0	℃	Ta =	59.0	℃
NEC	Tj = Tc + (θ j-c x Pd) =>			Tj =	60.7	℃	D.F. =	48.5	%
PC118	Tjmax=	125	℃	θj-c =	1666.00	℃/W			
PS2801-1-F3-A(P)	Pd =	0.001	W	ΔTa =	9.0	℃	Ta =	59.0	℃
NEC	Tj = Tc + (θ j-c x Pd) =>			Tj =	60.7	℃	D.F. =	48.5	%

3. Main components temperature rise

MODEL : 10V-40A

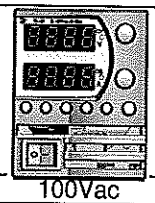
Condition:

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

Location No.	Parts Name	ΔT Temperature Rise (℃)	
		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℃**	**40℃**	**50℃**
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℃

(2) Test results

No.	Test Position		Test Mode		Test Result												
					1	2	3	4	5	6	7	8	9	10	11	12	
	Location	Test point	Short	Open	Fire	Smoke	Burst	Smell	Red hot	Damaged	Fuse open	OVP	OTP	No output	No change	Others	Note
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		•										•			
		G		•										•			
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 normaly 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 normaly after removing short
		D		•						•	•			•			F101 opened; Q105,Q107 - damaged
		S		•						•	•			•			F101 opened; Q105,Q107 - damaged
		G		•						•	•			•			F101 opened; Q105,Q107 - damaged
10	C148		•													•	P.S in CC mode output unstable P.S functional normaly 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

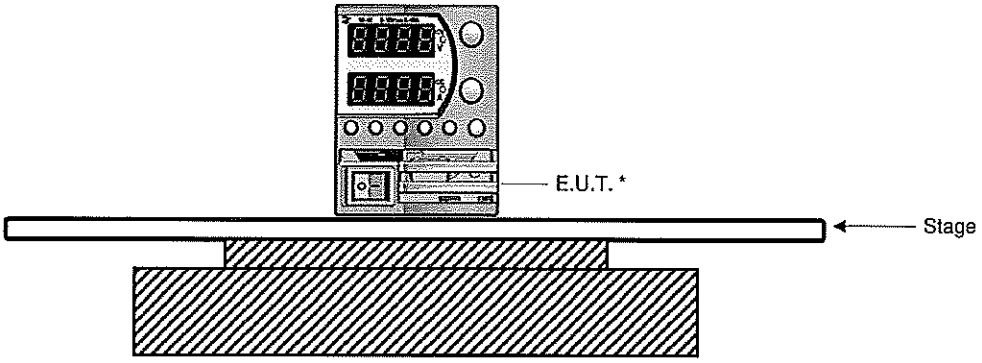
(1) Vibration test class

Frequency variable endurance test

(2) Equipment used

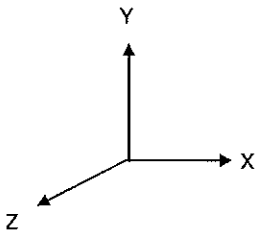
Name	Manufacturer	Model
Vibration Test System	Ling Dynamic Systems	V875
Laser Shaker Control System	DACTRON	LASER
Isotron Accelerometer 98.2 mV/g	Dytran instruments Inc.	3256A2
Isotron Accelerometer 101.7 mV/g	Dytran instruments Inc.	3049E3

(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 / Direction	10.00	40.00	O.K.
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℃

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

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)

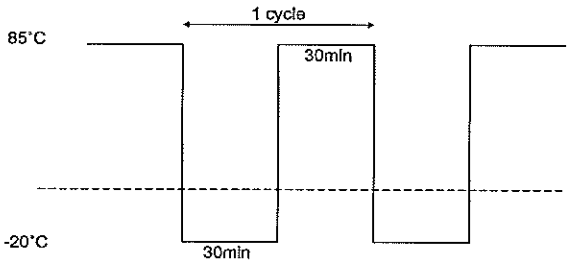
(3) Test condition

Ambient temperature: -20ºC <=> +85ºC

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 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
36.000V	36.002V	25mV	35.999V	36.000V	23mV

9. Fan Life Expectancy

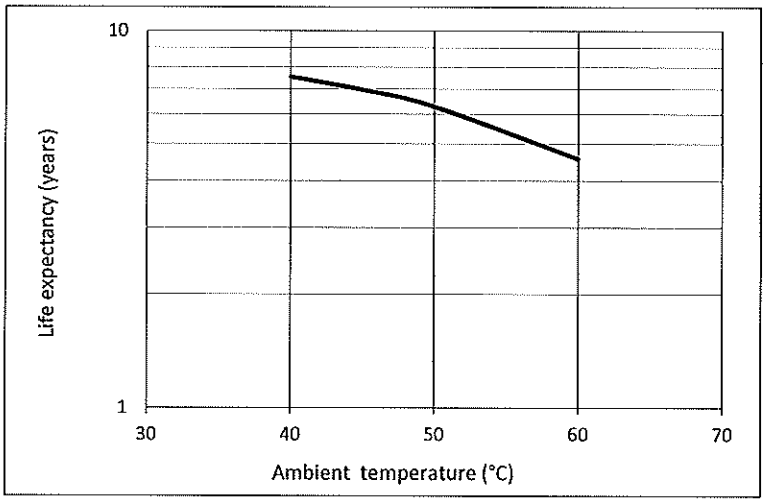
(1) Part name

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.



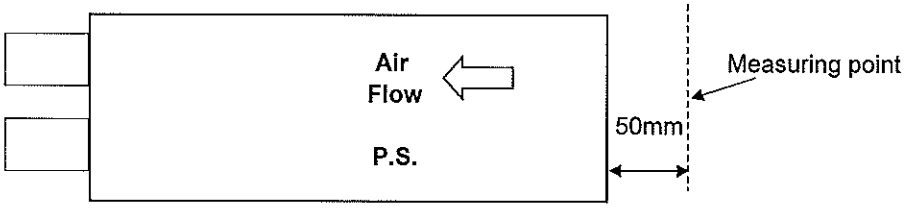


Fig1.Measuring point of fan ambient temperature.

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