Z+ 600 H.V Series

RELIABILITY

DATA

DWG No.: IA798-79-02		
APPD	CHK	DWG
3/12/14	3/12/14	Kami S. Nov-24-14

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

Z^+ 600 H.V Series

(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 = 76,274 (HOURS)

(MTBF calculation for fan isn't included.)

2. Components derating

Z^+ 600 H.V Series

(1) Calculation method

1. Measuring Conditions

Input: 100 , 200Vac

Output: Full load

Ambient temperature: 50°C

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:

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

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
Θ_{j-c}	: Thermal impedance between junction and case
Θ_{j-a}	: Thermal impedance between junction and air

(2) Component derating list

Location No.	Vin = 100Vac Load=100% Ta=50°C									
A101	Tjmax=	150	°C	θj-a =	120.0	°C/W				
L4981AD013TR	Pd =	0.2	W	ΔTa =	21.0	°C	Ta =	71.0	°C	
ST	Tj = Ta + (θ j-a x Pd) =>			Tj =	98.6	°C	D.F. =	65.7	%	
D101	Tjmax=	150	°C	θj-c =	0.6	°C/W				
GBJ2506-F	Pd =	14.2	W	ΔTc =	46.0	°C	Tc =	96.0	°C	
DIODES	Tj = Tc + (θ j-c x Pd) =>			Tj =	104.5	°C	D.F. =	69.7	%	
D106	Tjmax=	175	°C	θj-c =	1.2	°C/W				
IDH12SG60C	Pd =	2.6	W	ΔTc =	40.0	°C	Tc =	90.0	°C	
INFINEON	Tj = Tc + (θ j-c x Pd) =>			Tj =	93.1	°C	D.F. =	53.2	%	
D118	Tjmax=	175	°C	θj-c =	2.0	°C/W				
IDH12SG60C	Pd =	2.0	W	ΔTc =	39.2	°C	Tc =	89.2	°C	
INFINEON	Tj = Tc + (θ j-c x Pd) =>			Tj =	93.1	°C	D.F. =	53.2	%	
Q101	Tjmax=	150	°C	θj-c =	0.3	°C/W				
IPW60R075CP	Pd =	19.9	W	ΔTc =	38.7	°C	Tc =	88.7	°C	
INFINEON	Tj = Tc + (θ j-c x Pd) =>			Tj =	94.5	°C	D.F. =	63.0	%	
Q104	Tjmax=	150	°C	θj-c =	0.5	°C/W				
FMP30N60S1	Pd =	11.41	W	ΔTc =	55.8	°C	Tc =	105.8	°C	
INFINEON	Tj = Tc + (θ j-c x Pd) =>			Tj =	111.5	°C	D.F. =	74.3	%	
SC101	Tjmax=	125	°C	θj-c =	1.2	°C/W				
CR12CM-12A B00	Pd =	2.4	W	ΔTc =	35.1	°C	Tc =	85.1	°C	
RENESAS	Tj = Tc + (θ j-c x Pd) =>			Tj =	88.0	°C	D.F. =	70.4	%	
PC101	Tjmax=	125	°C	θj-c =	1.67	°C/W				
PS2801-1-F3-A(P)	Pd =	0.06	W	ΔTc =	17.4	°C	Tc =	67.4	°C	
NEC	Tj = Tc + (θ j-c x Pd) =>			Tj =	67.5	°C	D.F. =	54.0	%	
Q117	Tjmax=	150	°C	θj-c =	0.61	°C/W				
FMH09N90E	Pd =	0.0	W	ΔTc =	26.9	°C	Tc =	76.9	°C	
FUJI	Tj = Tc + (θ j-c x Pd) =>			Tj =	76.9	°C	D.F. =	51.3	%	

Location No.	Vin=100Vac Load=100% Ta=50°C									
A109 AD7798BRUZ ANALOG DEVICES	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.002	°C W	θj-c = ΔTc = Tj =	14.0 20.0 70.0	°C/W °C °C	Tc = D.F. =	70.0 46.7	°C %
A110 DAC8830ICDRG4 TI	Tjmax= Pd = Tj = Ta + (θ j-a x Pd) =>	150 1E-04	°C W	θj-a = ΔTa = Tj =	136.9 13.0 63.0	°C/W °C °C	Ta = D.F. =	63.0 42.0	°C %
A115 STM32F105VCT6TR ST	Tjmax= Pd = Tj = Ta + (θ j-a x Pd) =>	125 0.434	°C W	θj-a = ΔTa = Tj =	46.0 17.6 87.6	°C/W °C °C	Ta = D.F. =	67.6 70.1	°C %
A126 L4941BV ST	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.6	°C W	θj-c = ΔTc = Tj =	3.0 13.1 64.9	°C/W °C °C	Tc = D.F. =	63.1 43.3	°C %
A127 LM3940IT-3.3NOPB NATIONAL	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	125 0.5	°C W	θj-c = ΔTc = Tj =	4.0 16.0 68.0	°C/W °C °C	Tc = D.F. =	66.0 54.4	°C %
A141 LM78L15ACM NOPB NATIONAL	Tjmax= Pd = Tj = Ta + (θ j-a x Pd) =>	125 0.1	°C W	θj-a = ΔTa = Tj =	180.0 26.6 94.6	°C/W °C °C	Ta = D.F. =	76.6 75.7	°C %
A142 MIP2E5DMY MATSUSHITA	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 1.4	°C W	θj-c = ΔTc = Tj =	3.0 24.4 78.6	°C/W °C °C	Tc = D.F. =	74.4 52.4	°C %
A145 LM78L05ACMNOPB NATIONAL	Tjmax= Pd = Tj = Ta + (θ j-a x Pd) =>	125 0.08	°C W	θj-a = ΔTa = Tj =	231.0 18.8 87.3	°C/W °C °C	Ta = D.F. =	68.8 69.8	°C %
D122 CRH01(TE85L,Q) TOSHIBA	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.06	°C W	θj-c = ΔTc = Tj =	130.0 27.3 85.1	°C/W °C °C	Tc = D.F. =	77.3 56.7	°C %
D130 CRH01(TE85L,Q) TOSHIBA	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.035	°C W	θj-c = ΔTc = Tj =	130.0 17.4 72.0	°C/W °C °C	Tc = D.F. =	67.4 48.0	°C %
D136 CRH01(TE85L,Q) TOSHIBA	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.03	°C W	θj-c = ΔTc = Tj =	130.0 14.6 68.5	°C/W °C °C	Tc = D.F. =	64.6 45.7	°C %
Q116 IPI037N06L3 G INFINEON	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	175 0.46	°C W	θj-c = ΔTc = Tj =	6.3 38.8 91.7	°C/W °C °C	Tc = D.F. =	88.8 52.4	°C %
PC106 PS2581L2-E3-A(D) NEC	Tjmax= Pd = Tj = Ta+ (θ j-a x Pd) =>	125 0.004	°C W	θj-a = ΔTa = Tj =	666.7 11.1 63.8	°C/W °C °C	Ta = D.F. =	61.1 51.0	°C %

(2) Component derating list

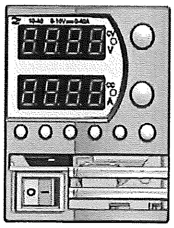
Location No.	Vin = 200Vac Load=100% Ta=50°C								
A101 L4981AD013TR ST	Tjmax= Pd = Tj = Ta + (θ j-a x Pd) =>	150 0.2	°C W	θj-a = ΔTa = Tj =	120.0 20.2 97.8	°C/W °C °C	Ta = D.F. =	70.2 65.2	°C %
D101 GBJ2506-F DIODES	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 6.3	°C W	θj-c = ΔTc = Tj =	0.6 23.8 77.6	°C/W °C °C	Tc = D.F. =	73.8 51.7	°C %
D106 IDH12SG60C INFINEON	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	175 2.6	°C W	θj-c = ΔTc = Tj =	1.2 26.5 79.6	°C/W °C °C	Tc = D.F. =	76.5 45.5	°C %
D118 IDH12SG60C INFINEON	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	175 2.0	°C W	θj-c = ΔTc = Tj =	2.0 38.2 92.1	°C/W °C °C	Tc = D.F. =	88.2 52.6	°C %
Q101 IPW60R075CP INFINEON	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 16.7	°C W	θj-c = ΔTc = Tj =	0.3 21.0 75.9	°C/W °C °C	Tc = D.F. =	71.0 50.6	°C %
Q104 FMP30N60S1 INFINEON	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 11.4	°C W	θj-c = ΔTc = Tj =	0.5 55.2 110.9	°C/W °C °C	Tc = D.F. =	105.2 73.9	°C %
SC101 CR12CM-12A B00 RENESAS	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	125 2.4	°C W	θj-c = ΔTc = Tj =	1.2 24.3 77.2	°C/W °C °C	Tc = D.F. =	74.3 61.7	°C %
PC101 PS2801-1-F3-A(P) NEC	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	125 0.06	°C W	θj-c = ΔTc = Tj =	1.67 13.8 63.9	°C/W °C °C	Tc = D.F. =	63.8 51.1	°C %
Q117 FMH09N90E FUJI	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.0	°C W	θj-c = ΔTc = Tj =	0.61 21.2 71.2	°C/W °C °C	Tc = D.F. =	71.2 47.5	°C %

Location No.	Vin=200Vac Load=100% Ta=50°C									
A109 AD7798BRUZ ANALOG DEVICES	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.002	°C W	θj-c = ΔTc = Tj =	14.0 18.8 68.8	°C/W °C °C	 Tc = D.F. =	 68.8 45.9	 °C %
A110 DAC8830ICDRG4 TI	Tjmax= Pd = Tj = Ta + (θ j-a x Pd) =>	150 1E-04	°C W	θj-a = ΔTa = Tj =	136.9 12.5 62.5	°C/W °C °C	 Ta = D.F. =	 62.5 41.7	 °C %
A115 STM32F105VCT6TR ST	Tjmax= Pd = Tj = Ta + (θ j-a x Pd) =>	125 0.434	°C W	θj-a = ΔTa = Tj =	46.0 15.2 85.2	°C/W °C °C	 Ta = D.F. =	 65.2 68.1	 °C %
A126 L4941BV ST	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.6	°C W	θj-c = ΔTc = Tj =	3.0 11.1 62.9	°C/W °C °C	 Tc = D.F. =	 61.1 41.9	 °C %
A127 LM3940IT-3.3NOPB NATIONAL	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	125 0.5	°C W	θj-c = ΔTc = Tj =	4.0 14.3 66.3	°C/W °C °C	 Tc = D.F. =	 64.3 53.0	 °C %
A141 LM78L15ACM NOPB NATIONAL	Tjmax= Pd = Tj = Ta + (θ j-a x Pd) =>	125 0.1	°C W	θj-a = ΔTa = Tj =	180.0 25.0 93.0	°C/W °C °C	 Ta = D.F. =	 75.0 74.4	 °C %
A142 MIP2E5DMY MATSUSHITA	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 1.4	°C W	θj-c = ΔTc = Tj =	3.0 24.3 78.5	°C/W °C °C	 Tc = D.F. =	 74.3 52.3	 °C %
A145 LM78L05ACMNOPB NATIONAL	Tjmax= Pd = Tj = Ta + (θ j-a x Pd) =>	125 0.08	°C W	θj-a = ΔTa = Tj =	231.0 18.6 87.1	°C/W °C °C	 Ta = D.F. =	 68.6 69.7	 °C %
D122 CRH01(TE85L,Q) TOSHIBA	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.06	°C W	θj-c = ΔTc = Tj =	130.0 26.4 84.2	°C/W °C °C	 Tc = D.F. =	 76.4 56.1	 °C %
D130 CRH01(TE85L,Q) TOSHIBA	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.035	°C W	θj-c = ΔTc = Tj =	130.0 16.1 70.7	°C/W °C °C	 Tc = D.F. =	 66.1 47.1	 °C %
D136 CRH01(TE85L,Q) TOSHIBA	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	150 0.03	°C W	θj-c = ΔTc = Tj =	130.0 13.8 67.7	°C/W °C °C	 Tc = D.F. =	 63.8 45.1	 °C %
Q116 IPI037N06L3 G INFINEON	Tjmax= Pd = Tj = Tc + (θ j-c x Pd) =>	175 0.46	°C W	θj-c = ΔTc = Tj =	6.3 37.7 90.6	°C/W °C °C	 Tc = D.F. =	 87.7 51.8	 °C %
PC106 PS2581L2-E3-A(D) NEC	Tjmax= Pd = Tj = Ta+ (θ j-a x Pd) =>	125 0.004	°C W	θj-a = ΔTa = Tj =	666.7 10.4 63.1	°C/W °C °C	 Ta = D.F. =	 60.4 50.5	 °C %

3. Main components temperature rise

MODEL : 160V-4A

Condition:

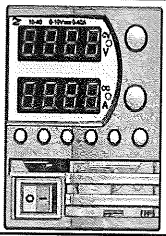
Standard Mounting	
Output Voltage	160V
Output Current	4A
Ta	50°C

Location No.	Parts Name	ΔT Temperature Rise (°C)	
		100Vac	200Vac
D116	DIODE	38.1	37.2
D117	DIODE	38.6	36.4
D118	DIODE	39.2	38.2
D119	DIODE	34.8	31.6
D101	BRIDGE	46.0	26.6
L101	COMMON CHOKE	31.0	17.1
L102	COMMON CHOKE	29.5	16.6
L103	CHOKE PFC	46.4	42.2
L104	CHOKE DC-DC IN	36.8	34.8
Q101	MOSFET	38.2	20.3
Q104	MOSFET	30.2	29.5
Q105	MOSFET	29.0	28.1
Q106	MOSFET	30.4	29.7
Q107	MOSFET	30.4	29.8
Q117	MOSFET	22.1	18.0
T101	TRANSFORMER IN	29.5	28.5
T102	TRANSFORMER	17.6	16.8
T103	TRANSFORMER	19.9	19.2
C101	FILM CAP.	24.3	15.6
C102	FILM CAP.	24.3	14.9
C103	CERAMIC CAP.	22.2	13.7
F101	FUSE	29.2	16.5
D106	DIODE	34.8	22.7
SC101	TRIAC	27.3	19.0
C112	CAP.ELECT.	12.0	9.5
C113	CAP.ELECT.	8.4	6.5
C105	FILM CAP.	26.0	19.9
C500	CAP.ELECT.	20.4	18.8
C502	CAP.ELECT.	18.9	17.3
C508	CAP.CER.	20.7	19.0
L500	CHOKE COIL	27.5	25.8
R500	CHIP RESISTOR	33.5	32.3
C507	CAP.ELECT.	22.0	20.0

3. Main components temperature rise

MODEL : 320V-2A

Condition:

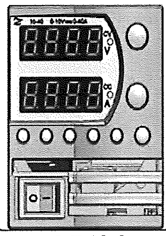
Standard Mounting	
Output Voltage	320V
Output Current	2A
Ta	50°C

Location No.	Parts Name	ΔT Temperature Rise (°C)	
		100Vac	200Vac
D116	DIODE	33.4	32.7
D117	DIODE	31.0	29.3
D118	DIODE	35.0	34.2
D119	DIODE	33.5	31.7
D101	BRIDGE	42.6	25.6
L101	COMMON CHOKE	31.2	19.6
L102	COMMON CHOKE	33.1	20.2
L103	CHOKE PFC	43.9	40.0
L104	CHOKE DC-DC IN	33.0	32.0
Q101	MOSFET	39.0	20.5
Q104	MOSFET	32.1	31.6
Q105	MOSFET	30.3	29.7
Q106	MOSFET	24.0	23.6
Q107	MOSFET	28.6	28.1
Q117	MOSFET	20.6	17.4
T101	TRANSFORMER IN	57.3	56.7
T101	TRANSFORMER CORE	31.0	30.7
T102	TRANSFORMER	15.9	15.2
T103	TRANSFORMER	20.1	19.6
TB101	AC INLET	22.9	15.0
C101	FILM CAP.	22.6	16.1
C102	FILM CAP.	26.6	18.0
C103	CERAMIC CAP.	25.2	16.5
F101	FUSE	31.1	18.0
D106	DIODE	36.6	23.6
SC101	TRIAC	29.3	19.5
C112	CAP.ELECT.	11.0	8.9
C113	CAP.ELECT.	7.0	5.6
R189	TH.RESISTOR	24.0	21.2
C500	CAP.ELECT.	19.5	18.4
C502	CAP.ELECT.	18.1	16.9
C508	CAP.CER.	29.6	26.9
L500	CHOKE COIL	23.8	22.6
R500	CHIP RESISTOR	25.8	25.0
C507	CAP.ELECT.	21.2	19.8

3. Main components temperature rise

MODEL : 650V-1A

Condition:

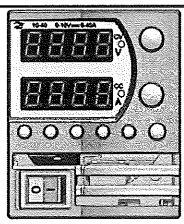
Standard Mounting	
Output Voltage	650V
Output Current	1A
Ta	50°C

Location No.	Parts Name	ΔT Temperature Rise (°C)	
		100Vac	200Vac
D116	DIODE	31.9	30.3
D117	DIODE	30.6	27.2
D118	DIODE	31.0	29.5
D119	DIODE	32.1	28.4
D101	BRIDGE	40.9	23.8
L101	COMMON CHOKE	31.7	17.3
L102	COMMON CHOKE	31.3	17.3
L103	CHOKE PFC	42.4	37.2
L104	CHOKE DC-DC IN	40.7	38.6
Q101	MOSFET	38.7	21.0
Q104	MOSFET	55.8	55.2
Q105	MOSFET	51.8	51.0
Q106	MOSFET	54.1	53.1
Q107	MOSFET	54.4	53.5
Q117	MOSFET	26.9	21.2
T101	TRANSFORMER IN	41.4	40.3
T102	TRANSFORMER	28.1	26.9
T103	TRANSFORMER	29.0	28.2
C101	FILM CAP.	24.9	16.9
C102	FILM CAP.	26.6	16.7
C103	CERAMIC CAP.	21.0	13.3
F101	FUSE	30.4	16.5
D106	DIODE	40.0	26.5
SC101	TRIAC	35.1	24.3
C112	CAP.ELECT.	16.0	13.9
C113	CAP.ELECT.	10.0	8.4
C105	FILM CAP.	22.8	17.6
C500	CAP.ELECT.	25.1	23.1
C502	CAP.ELECT.	22.2	20.0
C508	CAP.CER.	26.5	23.8
L500	CHOKE COIL	28.4	26.2
R500	CHIP RESISTOR	28.1	26.6
C507	CAP.ELECT.	26.9	24.4

4. Electrolytic capacitor lifetime

Z⁺ 600 H.V Series

Condition:

Standard Mounting	
Input Voltage	100Vac

	COMPUTED LIFE (year) at T(ambient)		
LOAD (%)	**30°C**	**40°C**	**50°C**
100	10.0	10.0	7.5

5. Abnormal test

MODEL : 650V-1.25A (Test results represent also Z650-1)

(1) Test condition and circuit:

Input Voltage: 230Vac   Output: 650V 1.25A   Ta : 50°C

(2) Test results

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 Damaged	7 Fuse open	8 OVP	9 OTP	10 AC FAIL	11 No output	12 No change	PS functional after AC recycle	13 Others	Note
1	C112		•								•			•	•				F101
2	D101	1-2	•								•			•	•				F101
3		2-4	•								•			•	•				F101
4	D104	A-K	•													•			
5	D106	A-K	•							•	•			•	•				D103, F101, Q101
6	D107	A-K	•															•	Pin decreased to 775W
7	D116	A-K	•							•	•			•	•			•	F101,Q104,Q106,D118
8	L103	3-4	•							•	•			•	•				L103,F101,Q101
9	Q101	D-G	•							•	•			•	•				F101, Q101
10		D-S	•								•			•	•				F101
11		G		•						•	•			•	•				F101, Q101
12	Q102	C-E	•							•							•		R135, R136
13	Q104	D-G	•							•	•			•	•				F101, Q104, Q105,D103
14		D-S	•							•	•			•	•				F101,Q105,D103
15		G		•														•	Pin decreased to 88W
16	Q108	C-E	•															•	Pin decreased to 98W
17	Q112	C-E	•												•				
18	Q117	D-S	•							•			•				•		Q117, Q118, R185, R186, R187, R189,R191
19		D-G	•							•			•				•		Q118, R185, R186, R187, R189, R199, A103
20	R125			•														•	Pin increased to 900W
21	SC101	2		•						•	•			•	•				F101, Q101, R123,R124
22	T101	8-9	•							•	•			•	•				F101, Q104, Q105,Q106,Q107,D103,R172
23	A126	1-2	•												•				No Display, No Fan
24	A141	2-8	•												•				No Display, No Fan
25	A142	1		•											•				No Display, No Fan
26		1-3	•							•	•			•	•				A142, F101, ZD120
27		2-3	•								•			•	•				F101
28	A143	3-5	•															•	Pin decreased to 625W
29	A145	2-8	•							•					•				No Fan, D136
30	D126	A-K	•												•				No Display, No Fan
31	D123	A-K	•												•				No Display, No Fan
32	D130	A-K	•												•				No Display, No Fan
33	D135	A-K	•															•	Pin decreased to 275W
34	D136	A-K	•												•				No Display, No Fan
35	C500		•							•	•			•	•				F101,L104,D116,D118,D103
36	C502		•								•			•	•				R123,R124,Q104,Q106,D116,L104
37	C503		•												•			•	Pin decreased to 22W
38	D500	A-K	•															•	V Fan decreased to 8.2V;All temperatures are normal

5. Abnormal test

MODEL : 160V-5A (Test results represent also Z160-4)

(1) Test condition and circuit:

Input Voltage: 230Vac Output:160V 5A Ta : 50°C

(2) Test results

No.	Test Position		Test Mode		Test Result														
					1	2	3	4	5	6	7	8	9	10	11	12		13	
	Location	Test point	Short	Open	Fire	Smoke	Burst	Smell	Red hot	Damaged	Fuse open	OVP	OTP	AC FAIL	No output	No change	PS functional after AC recycle	Others	Note
1	D116	A-K	•												•			•	Pin decreased to 40W
2	T101	8-10	•												•			•	Pin decreased to 40W
3	C500		•												•			•	Pin decreased to 74W
4	C502		•												•			•	Pin decreased to34W
5	D500	A-K	•															•	V Fan decreased to 10.1V;All temperatures are normal

6. Vibration test

Z^+ 600 H.V Series

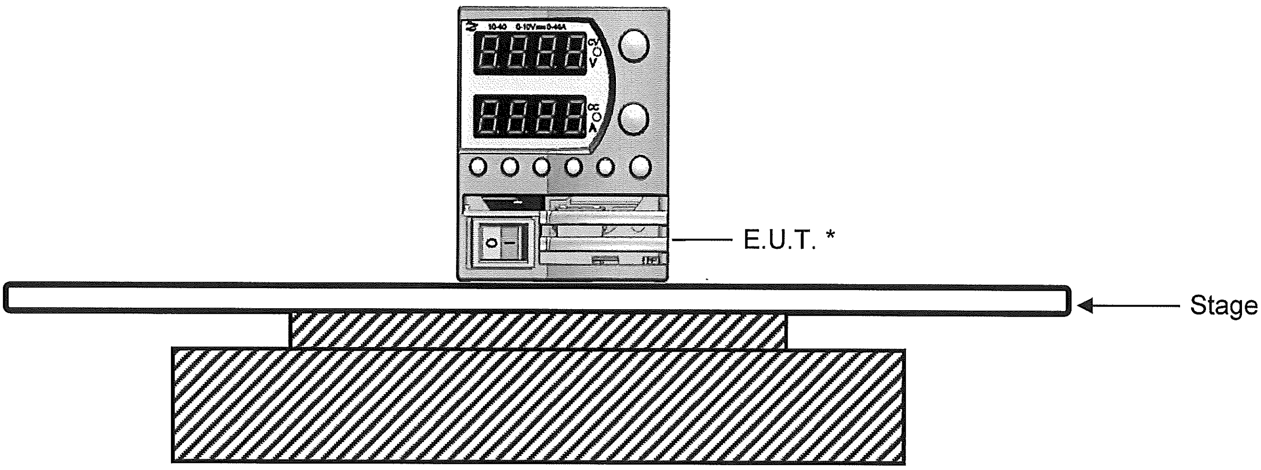
(1) Vibration test class

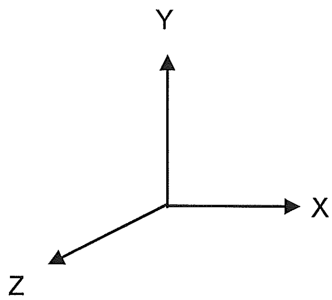
Frequency variable endurance test

(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	319.998	75.00	O.K.
X	319.998	75.00	O.K.
Y	319.982	70.00	O.K.
Z	322.998	75.00	O.K.

7. Noise Simulation Test

Z^+ 600 H.V Series

(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

8. Thermal Shock Test

Z^{+} 600 H.V Series

(1) Test Equipment

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

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

1 (unit)

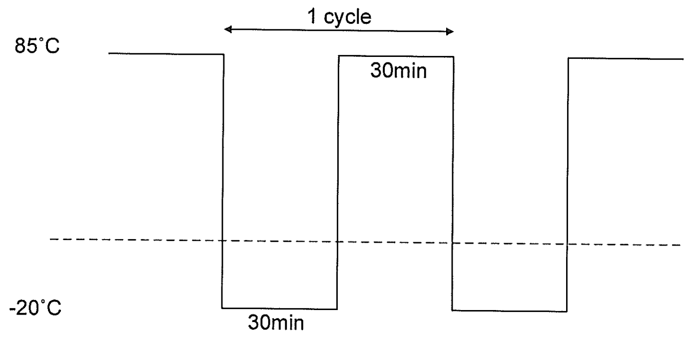
(3) Test condition

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
319.975V	319.975V	60mV	319.903V	319.904V	51mV

9. Fan Life Expectancy

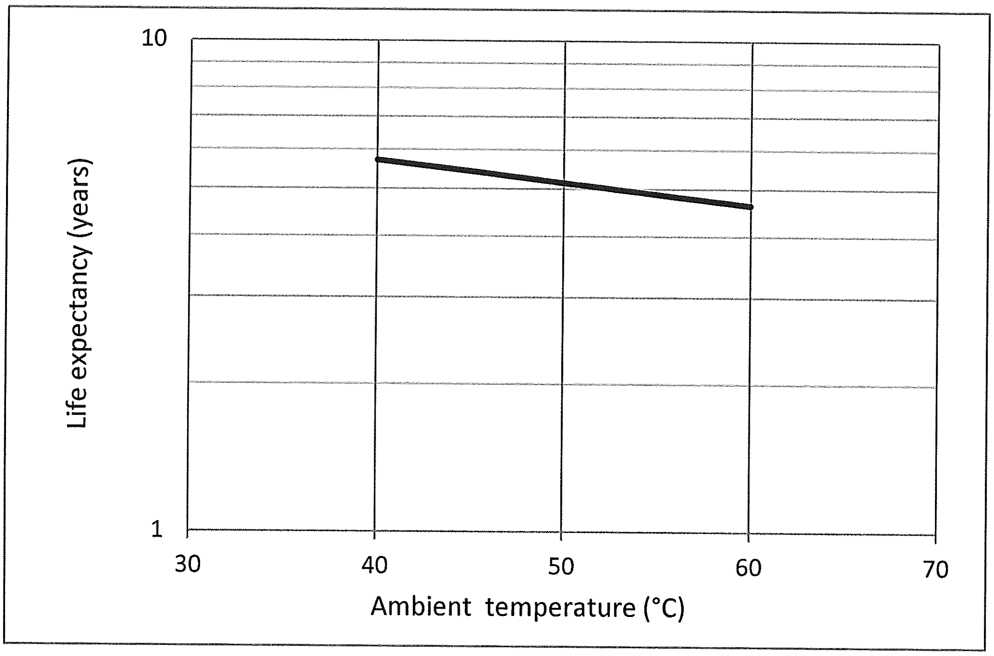
Z^+ 600 H.V Series

(1) Part name
H60T12BLA7-52 ("NIDEC")

(2) Life expectancy

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

Fig1. shows measuring point of ambient temperature.



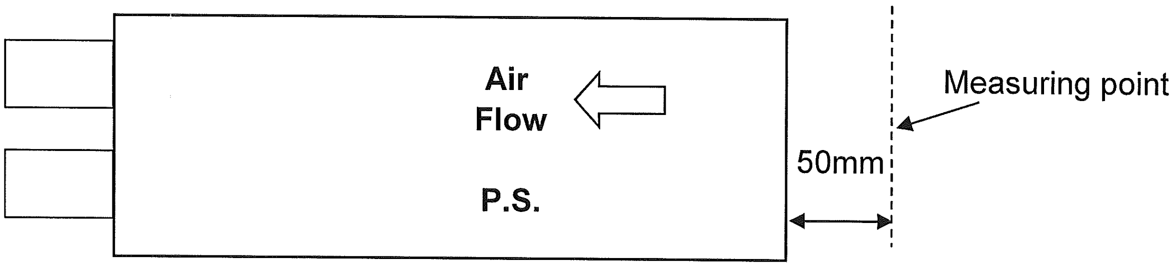


Fig1.Measuring point of fan ambient temperature.

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