ZWD150PAF

RELIABILITY DATA

DWG No.	PA573-57-01	
APPD	CHK	DWG
17/Aug/04	17/8/04.	16.08.2004

INDEX

* Test result are typical data. Nevertheless the following result are considered to be actual capability data because all units have nearly the same characteristics.

1. CALCULATED VALUES FOR MTBF

MODEL : ZWD150PAF-0524

1. Calculating Method

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

Formula :

$$MTBF = \frac{1}{\lambda_{equip}}$$

$$= \frac{1}{\sum_{i=1}^{n} N_i (\lambda_G \pi_Q) i} \times 10^6 \text{ (HOURS)}$$

where :

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

λ_G = Generic Failure Rate For The ith Generic Part (Failure / 10^6 Hours)

N_i = Quantity of ith Generic Part

n = Number of Different Generic Part Categories

π_Q = Generic Quality Factor for the ith Generic Part (π_Q = 1)

2. MTBF Values

G_F : (GROUND, FIXED)

MTBF = 288,062 (Hours)

2. COMPONENT DERATING

MODEL : ZWD150PAF-0524

1. Calculating Method

a) Measuring Conditions

Input Voltage	:	100VAC
Output Current	:	100%
Mounting Method	:	Standard Mounting
Ambient Temperature	:	50°C

b) Semiconductors

The derating is derived by comparing the junction temperature with the device maximum rating temperature. The junction temperature is calculated base on case tempeature, power dissipation and thermal impedance.

c) IC , Resistor , Capacitors , etc.

Ambient temperature , operating condition, power dissipation, etc are within derating criteria.

d) Calculating Method of Thermal Impedance

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

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_ℓ	=	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
R_{j-c} (R_{ch-c})	=	Thermal Impedance between Junction(channel) and Case
R_{j-a}	=	Thermal Impedance between Junction and Air
$R_{j-\ell}$	=	Thermal Impedance between Junction and Lead

(2) Component Derating List

Standard Mounting Position

Conditions Ta : 50°C
Vin : 100VAC
I1 : 5A
I2 : 5.2A

Q1 2SK2698 TOSHIBA	Tj(Tch)max	=	150 °C	delta Tc	=	48.2 °C	Tc	= 98.2 °C
	Rj(Rch) - c	=	0.833 °C/W	Pd(max)	=	150 W	Pd	= 5.5 W
	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	102.78 °C			
	Derating	=	68.52 %					
Q3 2SK1985-01MR FUJI ELEC.	Tj(Tch)max	=	150 °C	delta Tc	=	52.6 °C	Tc	= 102.6 °C
	Rj(Rch) - c	=	2.5 °C/W	Pd(max)	=	50 W	Pd	= 1.93 W
	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	107.41 °C			
	Derating	=	71.61 %					
Q5 2SK2611 TOSHIBA	Tj(Tch)max	=	150 °C	delta Tc	=	51.4 °C	Tc	= 101.4 °C
	Rj(Rch) - c	=	0.833 °C/W	Pd(max)	=	150 W	Pd	= 5.7 W
	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	106.15 °C			
	Derating	=	70.77 %					
Q100 2SC2712-Y TOSHIBA	Tj(Tch)max	=	125 °C	delta Tc	=	42.0 °C	Tc	= 92.0 °C
	Rj(Rch) - a	=	667 °C/W	Pd(max)	=	0.15 W	Pd	= 0.02 W
	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	105.34 °C			
	Derating	=	84.27 %					
Q101 2SK2177 SHINDENGEN	Tj(Tch)max	=	150 °C	delta Tc	=	41.5 °C	Tc	= 24.4 °C
	Rj(Rch) - c	=	12.5 °C/W	Pd(max)	=	10 W	Pd	= 0.00 W
	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	24.40 °C			
	Derating	=	16.27 %					
Q102 2SA1162-Y TOSHIBA	Tj(Tch)max	=	125 °C	delta Tc	=	38.0 °C	Tc	= 88.0 °C
	Rj(Rch) -c	=	667 °C/W	Pd(max)	=	0.15 W	Pd	= 0.00 W
	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	88.00 °C			
	Derating	=	70.40 %					
Q103 HN1B01F TOSHIBA	Tj(Tch)max	=	125 °C	delta Tc	=	38.7 °C	Tc	= 88.7 °C
	Rj(Rch) -c	=	500 °C/W	Pd(max)	=	0.2 W	Pd	= 0.00 W
	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	88.70 °C			
	Derating	=	70.96 %					
Q104 2SA1162-Y TOSHIBA	Tj(Tch)max	=	125 °C	delta Tc	=	42.0 °C	Tc	= 92.0 °C
	Rj(Rch) -c	=	667 °C/W	Pd(max)	=	0.15 W	Pd	= 0.00 W
	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	92.00 °C			
	Derating	=	73.60 %					
A1 UC2842AN ON-SEMI	Tj(Tch)max	=	150 °C	delta Tc	=	50.8 °C	Tc	= 100.8 °C
	Rj(Rch) - a	=	49 °C/W	Pd(max)	=	1.0 W	Pd	= 0.21 W
	Tj(Tch)	=	Tc + [(Rj(Rch)-a) x Pd]	=	111.29 °C			
	Derating	=	74.19 %					

(2) Component Derating List

Conditions Ta : 50°C
Vin : 100VAC
I1 : 5A
I2 : 5.2A

Standard Mounting Position

A100	Tj(Tch)max	=	150 °C	delta Tc	=	46.6 °C	Tc	=	96.6 °C
FA5502M	Rj(Rch) - c	=	50 °C/W	Pd(max)	=	0.65 W	Pd	=	0.2 W
FUJI ELEC.	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	106.60 °C				
	Derating	=	71.07 %						
A101	Tj(Tch)max	=	150 °C	delta Tc	=	60.9 °C	Tc	=	110.9 °C
M51995AFP-600C	Rj(Rch) - c	=	37 °C/W	Pd(max)	=	1.5 W	Pd	=	0.27 W
MITSUBISHI	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	120.89 °C				
	Derating	=	80.59 %						
A102	Tj(Tch)max	=	150 °C	delta Tc	=	44.2 °C	Tc	=	94.2 °C
HA17431UA	Rj(Rch) - c	=	156 °C/W	Pd(max)	=	0.8 W	Pd	=	0.01 W
HITACHI	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	95.76 °C				
	Derating	=	63.84 %						
A103	Tj(Tch)max	=	150 °C	delta Tc	=	44.2 °C	Tc	=	94.2 °C
HA17431UA	Rj(Rch) - c	=	156 °C/W	Pd(max)	=	0.8 W	Pd	=	0.01 W
HITACHI	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	95.76 °C				
	Derating	=	63.84 %						
A104	Tj(Tch)max	=	125 °C	delta Tc	=	45.4 °C	Tc	=	95.4 °C
UPC358G2-T1	Rj(Rch) - c	=	227 °C/W	Pd(max)	=	0.44 W	Pd	=	0.01 W
NEC	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	98.12 °C				
	Derating	=	78.50 %						
PC1	Tj(Tch)max	=	125 °C	delta Tc	=	22.7 °C	Tc	=	72.7 °C
TLP721F	Rj(Rch) - a	=	- °C/W	Pd(max)	=	- W	I_F	=	2.00 mA
(LED)	ALLOWABLE I_F (max) ≈ 35mA (at Ta=72.7°C)								
TOSHIBA	Derating	=	5.71 %						
PC1	Tj(Tch)max	=	125 °C	delta Tc	=	22.7 °C	Tc	=	72.7 °C
TLP721F	Rj(Rch) - a	=	667 °C/W	Pd(max)	=	0.15 W	Pd	=	0.002 W
(TRANSISTOR)	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	74.03 °C				
TOSHIBA	Derating	=	59.23 %						
PC2	Tj(Tch)max	=	125 °C	delta Tc	=	33.3 °C	Tc	=	83.3 °C
TLP721F	Rj(Rch) - a	=	- °C/W	Pd(max)	=	- W	I_F	=	0.00 mA
(LED)	ALLOWABLE I_F (max) ≈ 28mA (at Ta=83.3°C)								
TOSHIBA	Derating	=	0.00 %						
PC2	Tj(Tch)max	=	125 °C	delta Tc	=	33.3 °C	Tc	=	83.3 °C
TLP721F	Rj(Rch) - a	=	667 °C/W	Pd(max)	=	0.15 W	Pd	=	0 W
(TRANSISTOR)	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	83.30 °C				
TOSHIBA	Derating	=	66.64 %						

(2) Component Derating List

Standard Mounting Position

Conditions Ta : 50°C
Vin : 100VAC
I1 : 5A
I2 : 5.2A

PC3	Tj(Tch)max	=	125 °C	delta Tc	=	27.6 °C	Tc	= 77.6 °C
TLP721F	Rj(Rch) - a	=	- °C/W	Pd(max)	=	- W	I_F	= 6.00 mA
(LED)	ALLOWABLE I_F (max) ≈ 33mA (at Ta=77.6°C)							
TOSHIBA	Derating	=	18.18 %					
PC3	Tj(Tch)max	=	125 °C	delta Tc	=	27.6 °C	Tc	= 77.6 °C
TLP721F	Rj(Rch) - a	=	667 °C/W	Pd(max)	=	0.15 W	Pd	= 0.006 W
(TRANSISTOR)	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	81.60 °C		
TOSHIBA	Derating	=	65.28 %					
PC4	Tj(Tch)max	=	125 °C	delta Tc	=	33.3 °C	Tc	= 83.3 °C
TLP721F	Rj(Rch) - a	=	- °C/W	Pd(max)	=	- W	I_F	= 5.00 mA
(LED)	ALLOWABLE I_F (max) ≈ 28mA (at Ta=83.3°C)							
TOSHIBA	Derating	=	17.86 %					
PC4	Tj(Tch)max	=	125 °C	delta Tc	=	33.3 °C	Tc	= 83.3 °C
TLP721F	Rj(Rch) - a	=	667 °C/W	Pd(max)	=	0.15 W	Pd	= 0.005 W
(TRANSISTOR)	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	86.64 °C		
TOSHIBA	Derating	=	69.31 %					
PC5	Tj(Tch)max	=	125 °C	delta Tc	=	27.6 °C	Tc	= 77.6 °C
TLP721F	Rj(Rch) - a	=	- °C/W	Pd(max)	=	- W	I_F	= 0.00 mA
(LED)	ALLOWABLE I_F (max) ≈ 33mA (at Ta=77.6°C)							
TOSHIBA	Derating	=	0.00 %					
PC5	Tj(Tch)max	=	125 °C	delta Tc	=	27.6 °C	Tc	= 77.6 °C
TLP721F	Rj(Rch) - a	=	667 °C/W	Pd(max)	=	0.15 W	Pd	= 0 W
(TRANSISTOR)	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	77.60 °C		
TOSHIBA	Derating	=	62.08 %					
D1	Tj(Tch)max	=	150 °C	delta Tc	=	54.8 °C	Tc	= 104.8 °C
D5SB60	Rj(Rch) - c	=	3.4 °C/W	Pd(max)	=	- W	Pd	= 3.5 W
SHINDENGEN	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	116.70 °C		
	Derating	=	77.80 %					
D2	Tj(Tch)max	=	150 °C	delta Tc	=	50.2 °C	Tc	= 100.2 °C
FSU05B60	Rj(Rch) - c	=	5 °C/W	Pd(max)	=	16 W	Pd	= 1.5 W
NIHON INTER	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	107.70 °C		
	Derating	=	71.80 %					
D4	Tj(Tch)max	=	150 °C	delta Tc	=	56.0 °C	Tc	= 106.0 °C
SF30SC4	Rj(Rch) - c	=	2 °C/W	Pd(max)	=	- W	Pd	= 3 W
SHINDENGEN	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	112.00 °C		
	Derating	=	74.67 %					

(2) Component Derating List

Standard Mounting Position

Conditions Ta : 50°C
Vin : 100VAC
I1 : 5A
I2 : 5.2A

D5	Tj(Tch)max	=	150 °C	delta Tc	=	51.4 °C	Tc	=	101.4 °C
ESAD92M-02R	Rj(Rch) - c	=	2 °C/W	Pd(max)	=	- W	Pd	=	5.4 W
FUJI ELEC.	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	112.20 °C			
	Derating	=	74.80 %						
D100	Tj(Tch)max	=	150 °C	delta Tc	=	30.0 °C	Tc	=	80.0 °C
D1FL20U-4063	Rj(Rch) - a	=	157 °C/W	Pd(max)	=	- W	Pd	=	0 W
SHINDENGEN	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	80.00 °C			
	Derating	=	53.33 %						
D101	Tj(Tch)max	=	150 °C	delta Tc	=	30.0 °C	Tc	=	80.0 °C
D1FL20U-4063	Rj(Rch) - a	=	157 °C/W	Pd(max)	=	- W	Pd	=	0 W
SHINDENGEN	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	80.00 °C			
	Derating	=	53.33 %						
D102	Tj(Tch)max	=	125 °C	delta Tc	=	33.4 °C	Tc	=	83.4 °C
1SS184-TE85L	Rj(Rch) - c	=	667 °C/W	Pd(max)	=	0.15 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	83.40 °C			
	Derating	=	66.72 %						
D103	Tj(Tch)max	=	150 °C	delta Tc	=	46.1 °C	Tc	=	96.1 °C
U05NU44-TE12L	Rj(Rch) - a	=	125 °C/W	Pd(max)	=	1 W	Pd	=	0.05 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	101.85 °C			
	Derating	=	67.90 %						
D104	Tj(Tch)max	=	150 °C	delta Tc	=	35.6 °C	Tc	=	85.6 °C
D1FL20U-4063	Rj(Rch) - a	=	157 °C/W	Pd(max)	=	- W	Pd	=	0.01 W
SHINDENGEN	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	87.64 °C			
	Derating	=	58.43 %						
D105	Tj(Tch)max	=	125 °C	delta Tc	=	35.6 °C	Tc	=	85.6 °C
SFPB-54V	Rj(Rch) - l	=	155 °C/W	Pd(max)	=	- W	Pd	=	0.01 W
SANKEN	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	87.62 °C			
	Derating	=	70.09 %						
D106	Tj(Tch)max	=	125 °C	delta Tc	=	38.7 °C	Tc	=	88.7 °C
1SS184-TE85L	Rj(Rch) - a	=	667 °C/W	Pd(max)	=	0.15 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	88.70 °C			
	Derating	=	70.96 %						
D107	Tj(Tch)max	=	125 °C	delta Tc	=	24.4 °C	Tc	=	74.4 °C
1SS226-TE85L	Rj(Rch) - a	=	667 °C/W	Pd(max)	=	0.15 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]		=	74.40 °C			
	Derating	=	59.52 %						

(2) Component Derating List

Standard Mounting Position

Conditions Ta : 50°C
Vin : 100VAC
I1 : 5A
I2 : 5.2A

D108	Tj(Tch)max	=	150 °C	delta Tc	=	27.4 °C	Tc	=	77.4 °C
D1FL20U-4063	Rj(Rch) - a	=	157 °C/W	Pd(max)	=	- W	Pd	=	0 W
SHINDENGEN	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	77.56 °C				
	Derating	=	51.70 %						
D109	Tj(Tch)max	=	150 °C	delta Tc	=	25.6 °C	Tc	=	75.6 °C
D1FL20U-4063	Rj(Rch) - a	=	157 °C/W	Pd(max)	=	- W	Pd	=	0 W
SHINDENGEN	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	75.76 °C				
	Derating	=	50.50 %						
D110	Tj(Tch)max	=	125 °C	delta Tc	=	38.8 °C	Tc	=	88.8 °C
1SS184-TE85L	Rj(Rch) - a	=	667 °C/W	Pd(max)	=	0.15 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	89.47 °C				
	Derating	=	71.57 %						
D112	Tj(Tch)max	=	150 °C	delta Tc	=	57.1 °C	Tc	=	107.1 °C
D1FL20U-4063	Rj(Rch) - a	=	157 °C/W	Pd(max)	=	- W	Pd	=	0 W
SHINDENGEN	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	107.10 °C				
	Derating	=	71.40 %						
D113	Tj(Tch)max	=	150 °C	delta Tc	=	45.5 °C	Tc	=	95.5 °C
D1FL20U-4063	Rj(Rch) - a	=	108 °C/W	Pd(max)	=	- W	Pd	=	0 W
SHINDENGEN	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	95.50 °C				
	Derating	=	63.67 %						
D114	Tj(Tch)max	=	150 °C	delta Tc	=	44.2 °C	Tc	=	94.2 °C
1SS184-TE85L	Rj(Rch) - a	=	125 °C/W	Pd(max)	=	1 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	94.20 °C				
	Derating	=	62.80 %						
ZD100	Tj(Tch)max	=	150 °C	delta Tc	=	43.6 °C	Tc	=	93.6 °C
U1ZB27-TE12L	Rj(Rch) - a	=	125 °C/W	Pd(max)	=	1 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	93.60 °C				
	Derating	=	62.40 %						
ZD101	Tj(Tch)max	=	150 °C	delta Tc	=	39.4 °C	Tc	=	89.4 °C
02CZ2.2-X-TE85L	Rj(Rch) - c	=	625 °C/W	Pd(max)	=	0.2 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	89.40 °C				
	Derating	=	59.60 %						
ZD102	Tj(Tch)max	=	150 °C	delta Tc	=	38.8 °C	Tc	=	88.8 °C
U1ZB27-TE12L	Rj(Rch) - a	=	125 °C/W	Pd(max)	=	1 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	88.80 °C				
	Derating	=	59.20 %						

(2) Component Derating List

Conditions Ta : 50°C
Vin : 100VAC
I1 : 5A
I2 : 5.2A

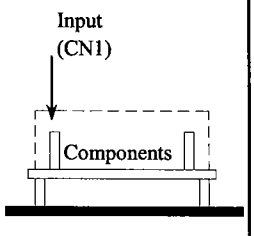
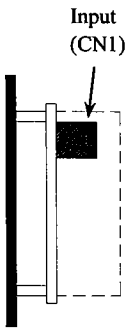
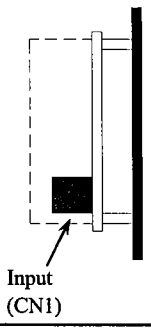
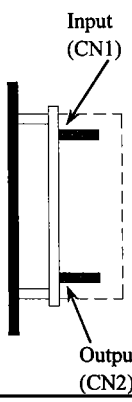
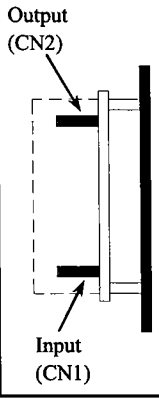
Standard Mounting Position

ZD103	Tj(Tch)max	=	150 °C	delta Tc	=	40.2 °C	Tc	=	90.2 °C
U1ZB27-TE12L	Rj(Rch) - a	=	125 °C/W	Pd(max)	=	1 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	90.20 °C				
	Derating	=	60.13 %						
ZD104	Tj(Tch)max	=	150 °C	delta Tc	=	38.8 °C	Tc	=	88.8 °C
02CZ15-Z-TE85L	Rj(Rch) - a	=	625 °C/W	Pd(max)	=	0.2 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	88.80 °C				
	Derating	=	59.20 %						
ZD105	Tj(Tch)max	=	150 °C	delta Tc	=	38.8 °C	Tc	=	88.8 °C
02CZ11-X-TE85L	Rj(Rch) - a	=	625 °C/W	Pd(max)	=	0.2 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	88.80 °C				
	Derating	=	59.20 %						
ZD106	Tj(Tch)max	=	150 °C	delta Tc	=	39.4 °C	Tc	=	89.4 °C
02CZ2.2-X-TE85L	Rj(Rch) - c	=	625 °C/W	Pd(max)	=	0.2 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	89.40 °C				
	Derating	=	59.60 %						
ZD107	Tj(Tch)max	=	150 °C	delta Tc	=	57.1 °C	Tc	=	107.1 °C
U1ZB27-TE12L	Rj(Rch) - c	=	125 °C/W	Pd(max)	=	1 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	107.10 °C				
	Derating	=	71.40 %						
ZD108	Tj(Tch)max	=	150 °C	delta Tc	=	45.5 °C	Tc	=	95.5 °C
02CZ5.6-Y-TE85L	Rj(Rch) - a	=	625 °C/W	Pd(max)	=	0.2 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	95.50 °C				
	Derating	=	63.67 %						
ZD109	Tj(Tch)max	=	150 °C	delta Tc	=	44.2 °C	Tc	=	94.2 °C
02CZ30-TE85R	Rj(Rch) - a	=	625 °C/W	Pd(max)	=	0.2 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	94.20 °C				
	Derating	=	62.80 %						
ZD110	Tj(Tch)max	=	150 °C	delta Tc	=	43.6 °C	Tc	=	93.6 °C
U1ZB6.8-TE12L	Rj(Rch) - a	=	625 °C/W	Pd(max)	=	0.2 W	Pd	=	0 W
TOSHIBA	Tj(Tch)	=	Tc + [(Rj(Rch)-c) x Pd]	=	93.60 °C				
	Derating	=	62.40 %						

3. MAIN COMPONENTS TEMPERATURE RISE ΔT LIST

MODEL : ZWD150PAF-0524

Measuring Conditions

Mounting Method	A	B	C	D	E
(Standard Mounting Method:(A))					
Input (VAC)	100		100		
Output (VDC)	5, 24		5, 24		
Output Current (A)	5.0, 5.2		2.5, 2.6		

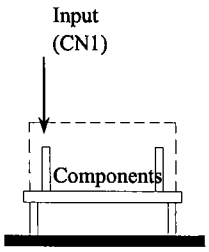
※ Condition Ta = 50°C , Convection cooling.

Output Derating (%) Ta = 50°C		ΔT List Temperature Rise (°C)				
		100		50		
Location No.	Parts Name	Mounting A	Mounting B	Mounting C	Mounting D	Mounting E
L1	BALUN COIL	47.8	47.3	33.9	50.8	34.1
L2	BALUN COIL	48.1	47.5	33.0	50.0	34.3
L3	CHOKE COIL	65.9	58.8	48.1	54.8	51.7
L5	CHOKE COIL	49.9	52.2	35.3	33.1	49.6
D1	BRIDGE DIODE	54.8	64.1	48.5	61.0	52.5
D2	DIODE	50.2	52.3	50.1	52.5	49.6
D4	S.B.D.	56.0	55.1	39.8	38.0	53.9
D5	LLD	51.4	61.1	37.8	42.4	48.0
Q1	MOSFET	48.2	48.6	51.4	55.2	51.4
Q3	MOSFET	52.6	54.0	46.3	47.9	52.8
Q5	MOSFET	51.4	61.3	45.9	58.7	52.6
A1	I.C.	50.8	48.3	53.0	47.1	62.4
A100	CHIP I.C.	46.6	45.5	37.5	52.3	45.7
A101	CHIP I.C.	60.9	61.2	57.4	62.5	63.3
T1	TRANS. PULSE	46.1	43.7	34.9	38.7	49.7
T2	TRANS. PULSE	51.4	54.4	39.0	46.0	51.2
C6	CAP.,ELECT.	31.5	30.1	22.8	27.4	31.3
C8	CAP., ELECT	32.6	41.0	37.2	32.3	50.8
C9	CAP., ELECT	33.3	43.0	31.0	39.8	46.3
C10	CAP., ELECT	35.1	42.0	30.9	36.4	45.8
C13	CAP., ELECT	36.0	32.8	27.5	21.0	45.8
C15	CAP., ELECT	25.9	25.9	24.8	18.5	41.8
C16	CAP., ELECT	36.0	32.8	27.5	21.0	45.8
C17	CAP., ELECT	34.0	20.5	24.3	18.7	38.8
C18	CAP., ELECT	34.0	20.5	24.3	18.7	38.8

4. ELECTROLYTIC CAPACITOR LIFETIME

MODEL : ZWD150PAF-0524

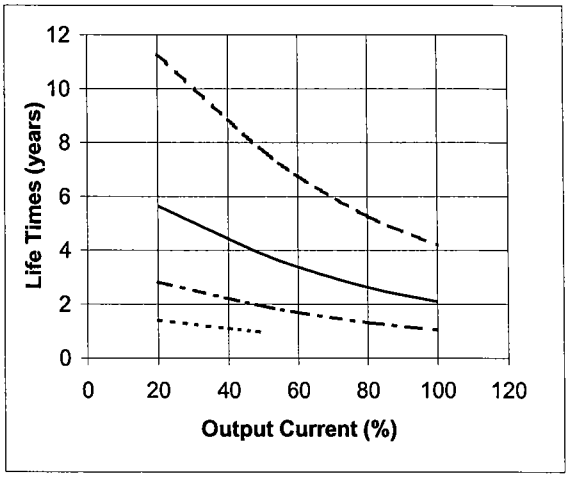
Mounting A



Ta = 30°C
= 40°C
= 50°C
= 60°C

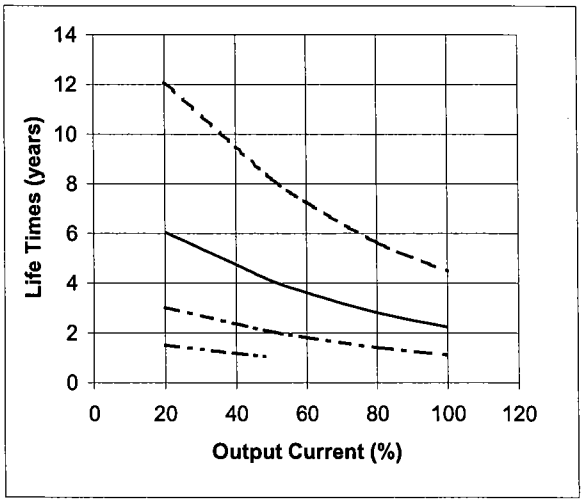
Vin = 100VAC

Load (%)	Life Time (years)			
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C
20	11.3	5.6	2.8	1.4
40	8.9	4.4	2.2	1.1
50	7.7	3.9	1.9	1.0
60	6.8	3.4	1.7	-
80	5.3	2.6	1.3	-
100	4.2	2.1	1.0	-



Vin = 200VAC

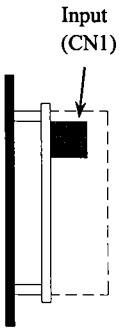
Load (%)	Life Time (years)			
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C
20	12.1	6.1	3.0	1.5
40	9.5	4.7	2.4	1.2
50	8.2	4.1	2.1	1.0
60	7.2	3.6	1.8	-
80	5.6	2.8	1.4	-
100	4.5	2.2	1.1	-



4. ELECTROLYTIC CAPACITOR LIFETIME

MODEL : ZWD150PAF-0524

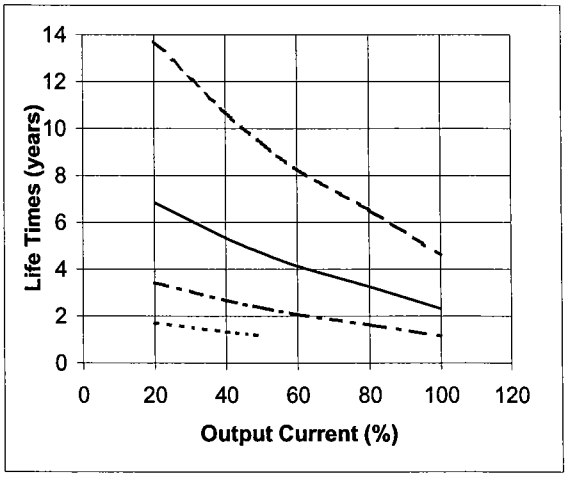
Mounting B



Ta = 30°C
= 40°C
= 50°C
= 60°C

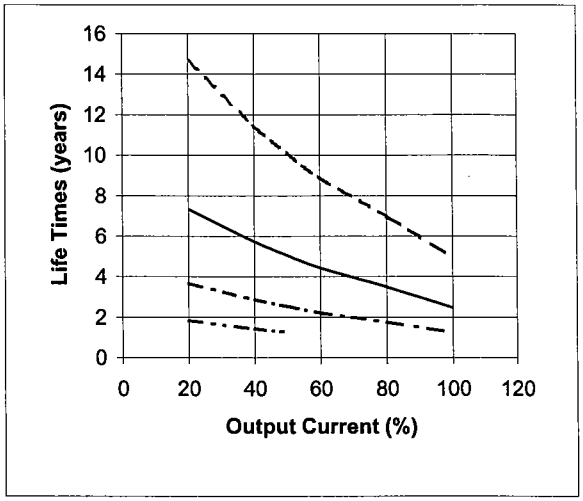
Vin = 100VAC

Load (%)	Life Time (years)			
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C
20	13.7	6.9	3.4	1.7
40	10.7	5.3	2.7	1.3
50	9.4	4.7	2.4	1.2
60	8.3	4.1	2.1	-
80	6.5	3.3	1.6	-
100	4.6	2.3	1.2	-



Vin = 200VAC

Load (%)	Life Time (years)			
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C
20	14.7	7.3	3.7	1.8
40	11.4	5.7	2.9	1.4
50	10.1	5.1	2.5	1.3
60	8.9	4.4	2.2	-
80	7.0	3.5	1.7	-
100	4.9	2.5	1.2	-



4. ELECTROLYTIC CAPACITOR LIFETIME

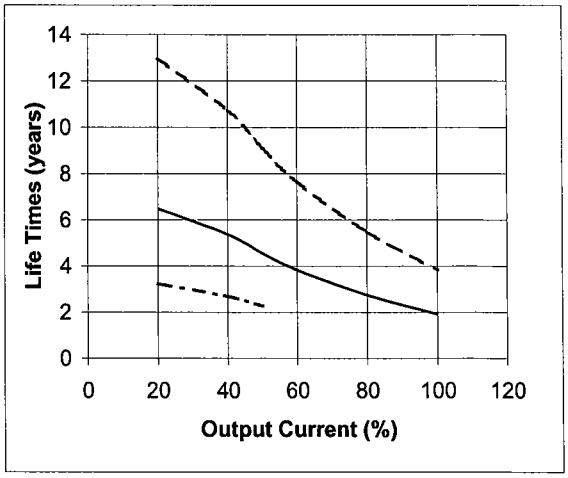
MODEL : ZWD150PAF-0524

Ta = 30°C
= 40°C
= 50°C
= 60°C

Mounting C

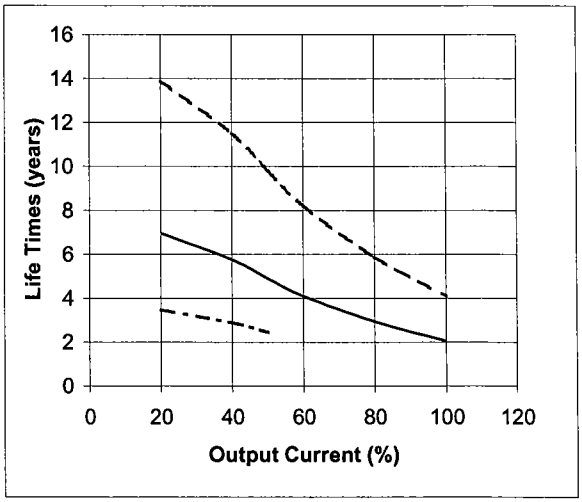
Vin = 100VAC

Load (%)	Life Time (years)			
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C
20	13.0	6.5	3.2	-
40	10.8	5.4	2.7	-
50	9.1	4.6	2.3	-
60	7.7	3.8	-	-
80	5.5	2.7	-	-
100	3.8	1.9	-	-



Vin = 200VAC

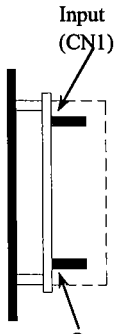
Load (%)	Life Time (years)			
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C
20	13.9	7.0	3.5	-
40	11.5	5.8	2.9	-
50	9.8	4.9	2.5	-
60	8.2	4.1	-	-
80	5.9	2.9	-	-
100	4.1	2.1	-	-



4. ELECTROLYTIC CAPACITOR LIFETIME

MODEL : ZWD150PAF-0524

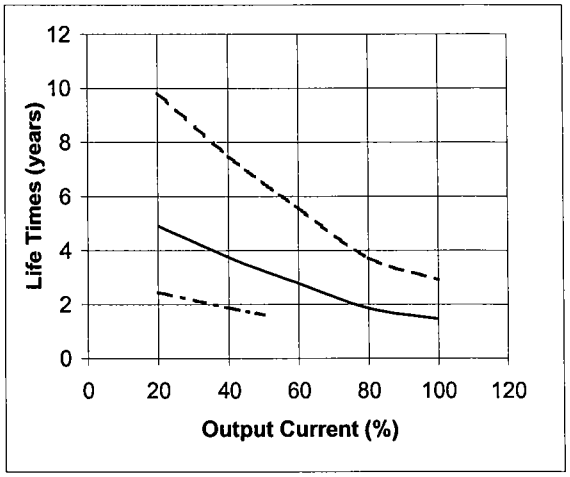
Mounting D



Ta = 30°C
= 40°C
= 50°C
= 60°C

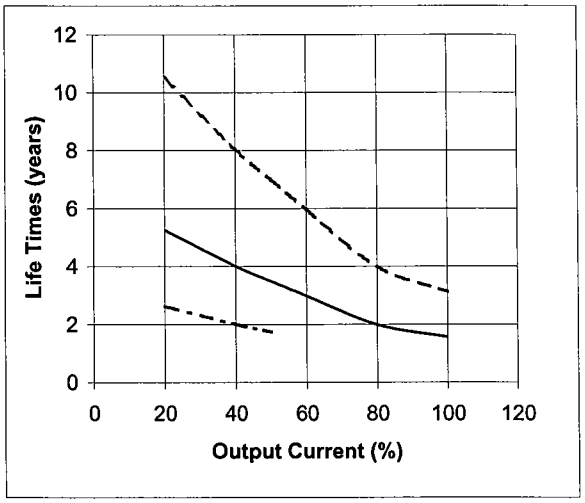
Vin = 100VAC

Load (%)	Life Time (years)			
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C
20	9.8	4.9	2.5	-
40	7.5	3.8	1.9	-
50	6.5	3.3	1.6	-
60	5.6	2.8	-	-
80	3.7	1.9	-	-
100	2.9	1.5	-	-



Vin = 200VAC

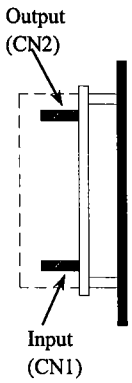
Load (%)	Life Time (years)			
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C
20	10.5	5.3	2.6	-
40	8.0	4.0	2.0	-
50	7.0	3.5	1.8	-
60	6.0	3.0	-	-
80	4.0	2.0	-	-
100	3.1	1.6	-	-



4. ELECTROLYTIC CAPACITOR LIFETIME

MODEL : ZWD150PAF-0524

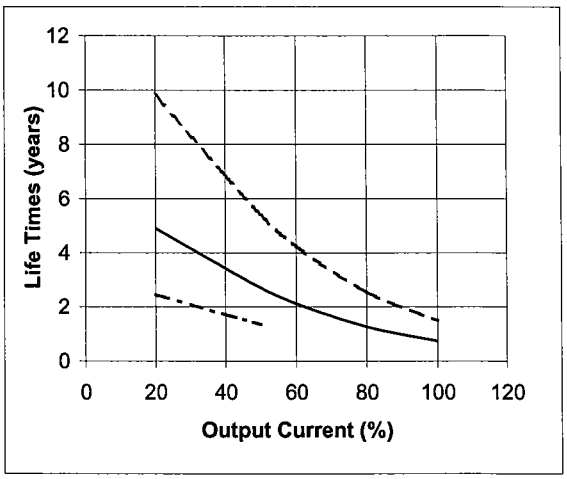
Mounting E



Ta = 30°C
= 40°C
= 50°C
= 60°C

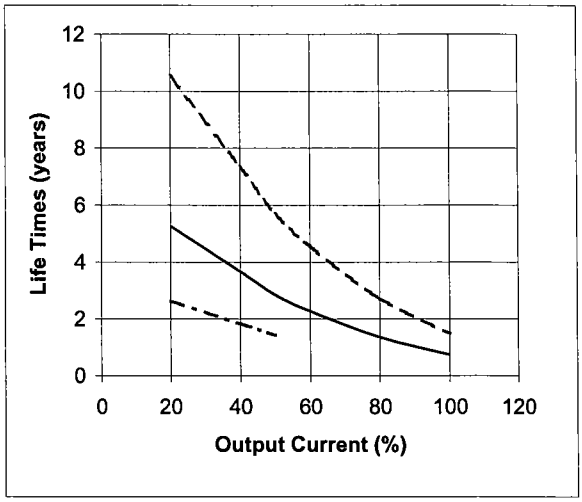
Vin = 100VAC

Load (%)	Life Time (years)			
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C
20	9.8	4.9	2.5	-
40	6.9	3.4	1.7	-
50	5.4	2.7	1.4	-
60	4.2	2.1	-	-
80	2.5	1.3	-	-
100	1.5	0.7	-	-



Vin = 200VAC

Load (%)	Life Time (years)			
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C
20	10.5	5.3	2.6	-
40	7.3	3.7	1.8	-
50	5.7	2.9	1.4	-
60	4.6	2.3	-	-
80	2.7	1.4	-	-
100	1.5	0.7	-	-



5. ABNORMAL TEST

MODEL : ZWD150PAF-0524

(1) Conditions

Input Voltage : 200VAC Output Current : 100% Ta : 25°C, 70%RH

(2) Test Results

(Da: Damaged)

No.	Test Position		Test Mode		Test Results												
					1	2	3	4	5	6	7	8	9	10	11	12	
	LOCATION	TEST POINT	SHORT	OPEN	FIRE	SMOKE	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOW	O.C.P.	O.V.P.	NO OUTPUT	NO CHANGE	OTHER	NOTE
1	Q1	G		●												●	Input Power Increase
		D		●												●	Input Power Increase
		S		●												●	Input Power Increase
		G - S	●													●	Input Power Increase
		D - G	●							●	●			●			Da: ZD100
		D - S	●								●			●			
2	Q3	G		●						●				●		●	Da:Q3,D103,D110,R130,R131,R133,A1
		D		●										●			
		S		●										●			
		G - S	●											●			
		D - G	●							●	●			●			Da: A1,ZD103
		D - S	●							●	●			●			Da: Q3,D100,D110
3	Q5	G		●						●	●			●			Da: Q5,D112,R200,R201
		D		●										●			Only for V2
		S		●										●			Only for V2
		G - S	●											●			Only for V2
		D - G	●							●	●			●			Da: ZD107,D112, R200,R201
		D - S	●							●	●			●			Da: D112, R200,R201
4	D1	AC - AC	●								●			●			
		AC - DC	●								●			●			
		AC		●										●			
		DC		●										●			
5	D2		●							●	●			●			Da: Q1
				●						●	●			●			Da: Q1
6	D4	A1		●											●		
		A2		●											●		
		K		●										●			
		A1 - K	●							●				●			Da: D103
		A2 - K	●							●				●			Da: D103
7	D5	A1		●										●			
		A2		●										●			
		K		●										●			
		A1 - K	●													●	Output Voltage Low Only For V2
		A2 - K	●													●	Output Voltage Low Only For V2
8	D103	A - K	●							●	●			●		●	Da: Q3
		A - K		●											●		
9	D104	A - K	●											●			
		A - K		●												●	Output Hiccup
10	D108	A - K	●													●	Output Hiccup
		A - K		●												●	Output Hiccup
11	D109	A - K	●													●	Output Hiccup
		A - K		●												●	Output Hiccup

5. ABNORMAL TEST

MODEL : ZWD150PAF-0524

(1) Conditions

Input Voltage : 200VAC Output Current : 100% Ta : 25°C, 70%RH

(2) Test Results

(Da: Damaged)

No.	Test Position		Test Mode		Test Results												
	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	NOTE
12	D113	A - K	●											●			Only For V2
		A - K		●												●	Output Hiccup Only For V2
13	ZD102	A - K	●											●			
		A - K		●											●		
14	A1	1		●										●			
		2		●										●			
		3		●										●			
		4		●										●			
		5		●										●			
		6		●										●			
		7		●										●			
		8		●										●			
15	A100	1 - 2	●											●			
		2 - 3	●												●		
		3 - 4	●												●		
		4 - 5	●													●	Low Output
		5 -6	●													●	Low Output
		6 -7	●												●		
		7 - 8	●													●	Low Output
		9 - 10	●												●		
		10 - 11	●												●		
		11 - 12	●												●		
		12 - 13	●												●		
		13 - 14	●													●	Low Output
		14 - 15	●												●		
		15 - 16	●											●			
16	A101	1 - 2	●												●		
		2 - 3	●											●			Only For V2
		3 - 4	●												●		
		4 - 5	●												●		
		6 - 7	●												●		
		7 - 8	●												●		
		9 - 10	●											●			Only For V2
		11 - 12	●											●			Only For V2
		12 - 13	●											●			Only For V2
		13 - 14	●												●		
		14 - 15	●												●		
		18 - 19	●												●		
		19 - 20	●											●			Only For V2
17	T1	2,3 - 4,5	●								●			●			Da: D103,D104,Q3,R128,R129
		9 - 10	●											●			
		7 - 8	●											●			
		2,3		●										●			
		7		●												●	Output Hiccup
		9		●												●	Output Hiccup

5. ABNORMAL TEST

MODEL : ZWD150PAF-0524

(1) Conditions

Input Voltage : 200VAC Output Current : 100% Ta : 25°C, 70%RH

(2) Test Results

(Da: Damaged)

No.	Test Position		Test Mode		Test Results												
	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	NOTE
18	T2	1 - 2	●													●	Output Hiccup Only for V2
		2 - 4	●							●	●			●			Da: D103
		3 - 4	●											●			Only For V2
		6,7 - 8,9	●											●			Only For V2
		1		●												●	Output Voltage Low Only for V2
		3		●										●			Only For V2
		6,7		●										●			Only For V2
19	L3	1 - 5	●											●			
		8 - 10	●													●	Output Voltage Unstable
		1		●										●			
		8		●												●	Output Voltage Unstable
		10		●												●	Output Voltage Unstable
20	L4		●												●		Only for V1
				●										●			
21	L5		●													●	Output Voltage Low Only for V2
				●										●			Only for V2
22	C6		●								●			●			
				●						●	●			●			Da: Q1
23	C13		●											●			Da: D103,D4
				●												●	Output Noise Increase only For V1
24	C16		●									●		●			Da: D103,D4,L4
				●												●	Output Noise Increase only For V1
25	C18		●									●		●			Only For V2. V1 No Changed
				●												●	Output Noise Increase only For V2
26	R5		●												●		
				●										●			
27	R155		●												●		
				●												●	Input Power Increase

6. VIBRATION TEST

MODEL : ZWD150PAF-0524

(1) Vibration Test Class

Frequency Variable Endurance Test

(2) Equipment Used

Controller	:	F-400-BM-E47 (EMIC CORP.)
Vibrator	:	905-FN (EMIC CORP.)

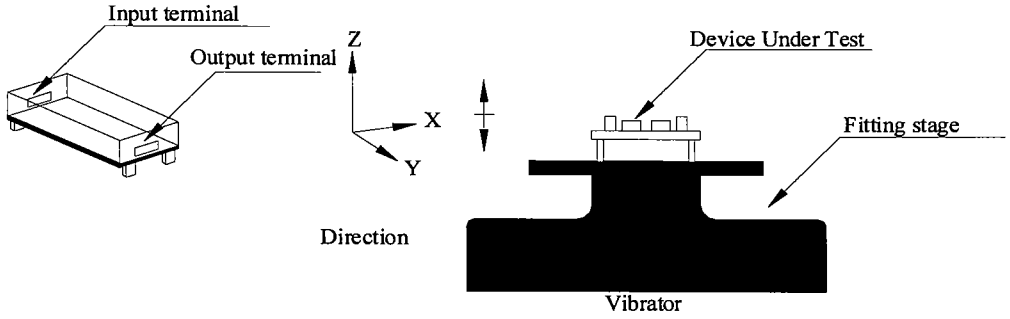
(3) The Number Of D.U.T. (Device Under Test)

1 Unit

(4) Test Conditions

Sweep Frequency	:	10 - 55Hz	Direction	:	X, Y, Z
Sweep Time	:	1 min.	Test Time	:	1 hour each axis
Acceleration	:	Constant 19.6m/s^2 (2G)			

(5) Test Method



(6) Test results - OK

Test Conditions :- Vin = 100 VAC I1 = 5A
Ambient Temperature = 25 °C I2 = 6A

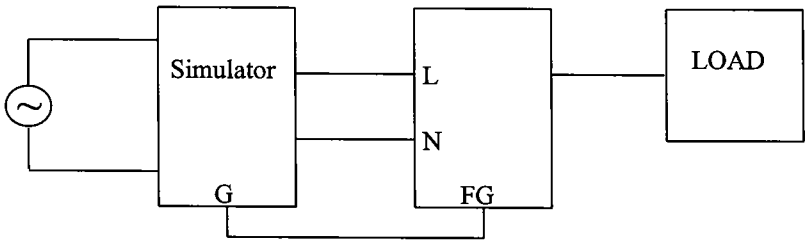
Output Voltage		V1	V2	D.U.T	V1	V2	D.U.T
Check Item		Output Voltage(V)		State	Ripple & Noise (mV)		State
Before Test		5.008	23.989	OK	50	88	OK
After Test	X	5.008	23.972	OK	55	83	OK
	Y	5.007	23.952	OK	52	85	OK
	Z	5.008	23.943	OK	56	87	OK

7. NOISE SIMULATION TEST

MODEL : ZWD150PAF-0524

(1) Test Circuit And Equipment

Noise Simulator : ENS-24X SANKI E.IND



(2) Test Conditions

Input voltage	:	100 , 230VAC	Noise level	:	0V - 2KV
Output Voltage	:	Rated	Phase shift	:	0° - 360°
Output Current	:	0%, 100%	Polarity	:	+ , -
Ambient Temperature	:	25°C	Mode	:	NORMAL, COMMON
Pulse width	:	50ns - 1000ns	Trig Select	:	LINE

(3) Acceptable Conditions

1. Not to be broken.
2. Not to be shut down output.
3. No other out of orders

(5) Test results - OK

8. THERMAL SHOCK TEST

MODEL : ZWD150PAF-0524

(1) Equipment Used

Thermal Shock Chamber TSA - 715 - A (ESPEC CORP.)

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

1 unit

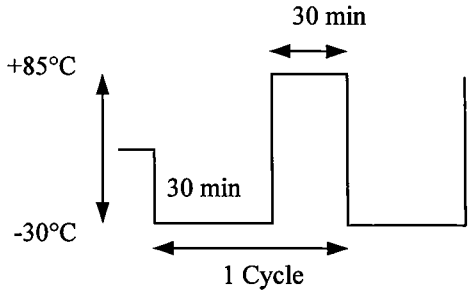
(3) Test Conditions

Ambient Temperature : -30°C ~ +85°C

Test Time : Refer to drawing

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 : 100VAC
I1 : 5A
I2 : 6A

			V1				V2			
			From		To		From		To	
Ripple & Noise		mV	50		52		85		90	
Line Regulation	MIN	V	5.006	0mV	5.043	8mV	23.993	3mV	23.990	3mV
	MAX	V	5.006		5.051		23.996		23.993	
Load Regulation	0%	V	5.007	1mV	5.046	3mV	24.017	21mV	24.013	20mV
	100%	V	5.006		5.043		23.996		23.993	
Solder Condition • etc			OK							