DRB480-24-1

RELIABILITY DATA

DWG. No.		
APPD	CHK	DWG
RJ	AK	

TDK-Lambda

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※ Test results are typical data.

1. Calculated values for MTBF

MODEL : DRB480-24-1

1. Calculating Method

Calculated based on part count reliability projection of Telcordia (*1).
Individual failure rates l_G is given to each part and MTBF is calculated by the count of each part.

*1: Telcordia Document "Reliability Prediction Procedure for Electronic Equipment"
(Document number SR-332 Issue3 ,Method I,Quality level II)

Formula :

$$MTBF = \frac{1}{\lambda equip} = \frac{1}{\sum_{i=1}^{n} Ni\,(\lambda_G \pi_Q)_i} \times 10^6 \text{ (HOURS)}$$

where :

$\lambda equip$ = Total Equipment Failure Rate (Failure / 106 Hours)

λ_G = Generic Failure Rate For The ith Generic Part (Failure / 106 Hours)

Ni = 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

Environmental factor: GB (Ground, Benign)

Line Input	Output Volts	Load	Tamb	MTBF (hrs)
100V	24V	15A	40°C	380,00
120V	24V	20A	25°C	437,000
120V	24V	20A	50°C	122,000
230V	24V	20A	25°C	644,000
230V	24V	20A	50°C	173,000

2. Component derating

MODEL : DRB480-24-1

(1) Calculating method

(a) Measuring Conditions

Input	:	120 VAC	□ Ambient temperature	:	50°C
Output	:	24V 20A (100%)	Mounting method	:	Mounting A

(b) Semiconductors

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

(c) IC.

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

(d) Calculating Method of Thermal Impedance

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

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_j : 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

(θ_{j-c}) (θ_{ch-c}) :Thermal impedance between junction(channel) and case

θ_{j-a} :Thermal impedance between junction and air

θ_{j-l} :Thermal impedance between junction and lead

(2) Component Derating List

MODEL : DRB480-24-1

Location No.	Vin = 120VAC	Load = 100%	Ta = 50°C
D11 RS1007M RECTRON	Tjmax = 150°C, Pd = 4W, Tj = Tc + ((θ j-c) × Pd) = 110°C D.F. = 73%	θ j-c = 1.0°C/W Δ Tc = 4°C	Tc = 106°C
D3 RURP860 FAIRCHILD	Tjmax = 175°C, Pd = 1.8W, Tj = Tc + ((θ j-c) × Pd) = 89.6°C D.F. = 51.2%	θ j-c = 2°C/W Δ Tc = 3.6°C,	Tc = 86°C
Q1 TK39N60X TOSHIBA	Tjmax = 150°C, Pd = 10W, Tj = Tc + ((θ j-c) × Pd) = 86.6°C D.F. = 58%	θj-c = 0.55°C/W, Δ Tc = 5.5°C,	Tc = 81.1°C
Q2 TK39N60X TOSHIBA	Tjmax = 150°C, Pd = 10W, Tj = Tc + ((θ j-c) × Pd) = 85.3°C D.F. = 57%	θj-c = 0.55°C/W, Δ Tc = 5.5°C,	Tc = 79.8°C
Q5 IPW60R160C6 INFINEON	Tjmax = 150°C, Pd = 2.5W, Tj = Tc + ((θ j-c) × Pd) = 87.4°C D.F. = 58%	θ j-c = 0.71°C/W Δ Tc = 1.8°C,	Tc = 85.6°C
Q6 IPW60R160C6 INFINEON	Tjmax = 150°C, Pd = 2.5W, Tj = Tc + ((θ j-c) × Pd) = 88.8°C D.F. = 59%	θ j-c = 0.71°C/W Δ Tc = 1.8°C,	Tc = 87°C
Q3 FDP085N10A FAIRCHILD	Tjmax = 175°C, Pd = 4W, Tj = Tc + ((θ j-c) × Pd) = 113.2°C D.F. = 65%	θj-c = 0.8°C/W, Δ Tc = 3.2°C,	Tc = 110°C
Q4 FDP085N10A FAIRCHILD	Tjmax = 175°C, Pd = 4W, Tj = Tc + ((θ j-c) × Pd) = 115.8°C D.F. = 66%	θ j-c = 0.8°C/W Δ Tc = 3.2°C	Tc = 112.6°C
XU101 L6562 ST	Tjmax = 150°C, Pd = 0.12W, Tj = Tc + ((θ j-c) × Pd) = 106°C D.F. = 71%	θ j-c = 150°C/W Δ Tc = 18°C	Tc = 87.5°C
XU100 L6699 ST	Tjmax = 150°C, Pd = 0.36W, Tj = Tc + ((θ j-c) × Pd) = 110.6°C D.F. = 74%	θ j-c = 60°C/W Δ Tc = 21.6°C	Tc = 89°C
XU301 TEA1995 NXP	Tjmax = 150°C, Pd = 0.12W, Tj = Tc + ((θ j-c) × Pd) = 101.9°C D.F. = 68%	θ j-c = 100°C/W Δ Tc = 12°C	Tc = 89.9°C

3. Main components temperature rise ΔT list

MODEL : DRB480-24-1

Condition:

Standard Mounting Mounting Method (A)	
Input Voltage (VAC)	120
Output Voltage (VAC)	24
Output Current (A)	20

Output Derating		DT Temperature rise (°C)	
		Io = 100% (Ta = 50°C)	Io = 62.5 % (Ta = 70°C)
Location No	Parts Name	Mounting (A)	Mounting (A)
L2	BALUN COIL	50	34
L4	RESONANT COIL	55	38
L1	PFC COIL	53	40
TX1	MAIN TRANSFORMER	61	40
D11	BRIDGE DIODE	56	38
D3	PFC DIODE	36	25
Q1	PRIMARY MOS FET	31	22
Q2	PRIMARY MOS FET	30	21
Q3	SECONDARY MOS FET	60	34
Q4	SECONDARY MOS FET	63	35
Q5	PRIMARY MOS FET	36	24
Q6	PRIMARY MOS FET	37	25
U2	CHIP OPTO COUPLER	41	29
U3	CHIP OPTO COUPLER	41	29
XU100	IC	39	28
XU101	IC	38	29
XU301	IC	40	27
XU402	PHOTO RELAY	48	24
C5	E. CAP	27	19
C9	E. CAP	50	33
C10	E. CAP	29	22
C13	E. CAP	42	30

3. Main components temperature rise ΔT list

MODEL : DRB480-24-1

Condition:

Standard Mounting Mounting Method (A)	
Input Voltage (VAC)	240
Output Voltage (VAC)	24
Output Current (A)	20

Output Derating		DT Temperature rise (°C)	
		Io = 100% (Ta = 50°C)	Io = 62.5% (Ta = 70°C)
Location No	Parts Name	Mounting (A)	Mounting (A)
L2	BALUN COIL	32	24
L4	RESONANT COIL	56	45
L1	PFC COIL	47	38
TX1	MAIN TRANSFORMER	58	49
D11	BRIDGE DIODE	44	30
D3	PFC DIODE	36	37
Q1	PRIMARY MOS FET	31	29
Q2	PRIMARY MOS FET	30	30
Q3	SECONDARY MOS FET	57	46
Q4	SECONDARY MOS FET	63	52
Q5	PRIMARY MOS FET	38	30
Q6	PRIMARY MOS FET	39	31
U2	CHIP OPTO COUPLER	41	35
U3	CHIP OPTO COUPLER	39	34
C5	E. CAP	20	15
C9	E. CAP	38	24
C10	E. CAP	30	22
C13	E. CAP	45	27

4. Electrolytic capacitor lifetime

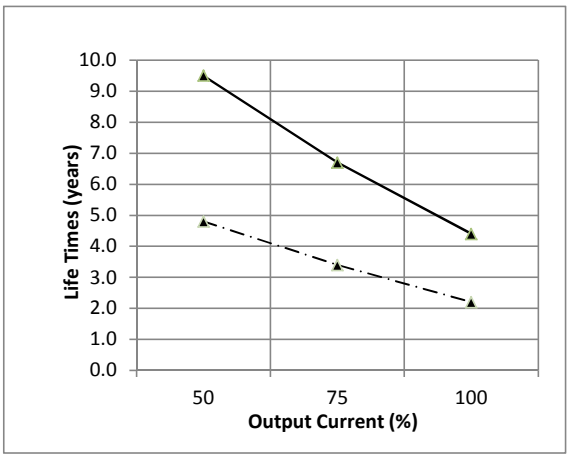
MODEL : DRB480-24-1

Ta = 40°C
= 50°C

Standard Mounting

Vin = 120VAC

Load (%)	Life Time (years)	
	Ta = 40°C	Ta = 50°C
50	9.5	4.8
75	6.7	3.4
100	4.4	2.2



Vin = 230VAC

Ta = 40°C 100% load Lifetime 5.5years
Ta = 50°C 100% load Lifetime 2.8years

Note : E-cap life calculation is based on 24hrs/day operation.
eg For 12Hrs/day operation life numbers will double

5. Vibration Test

MODEL : DRB480-24-1

(1) Vibration Test Class

Frequency Variable Endurance Test

(2) Equipment Used

Controller	:	Dactron shaker control system
Vibrator	:	Ling Dynamic system Ltd shaker
Accelerometer	:	PA500 power amplifier

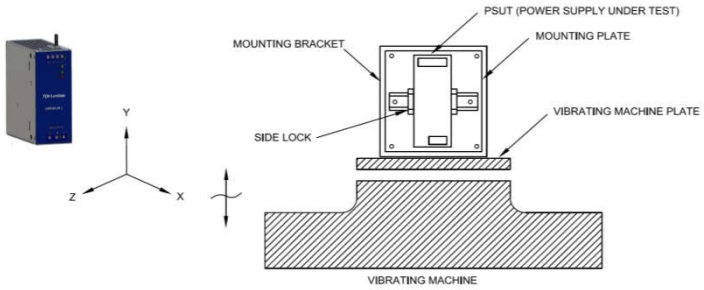
(3) The Number Of D.U.T. (Device Under Test)

1 Unit

(4) Test Conditions

Sweep Frequency	:	10 - 500Hz	Direction	:	X, Y, Z
Sweep Time	:	1 minute	Test Time	:	1 hour each axis
Acceleration	:	2.2G	Non-operation		
Mounting	:	Standard Mounting			

(5) Test Method



Fix the PSUT on the mounting rail with stopper on each corner.
Standard mounting position as per picture above.

(6) Test results - visually OK and functions after test

6. Thermal shock test

MODEL : DRB480-24-1

(1) Equipment used

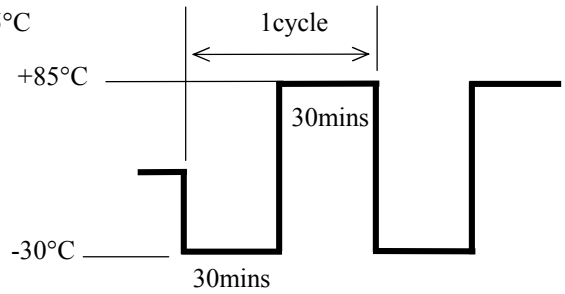
Thermal shock chamber Thermotron

(2) The number of PSUT.(Power Supply Under Test)

1 unit

(3) Test Conditions

- Ambient temperature : -30°C ⟷ +85°C
- Test time : 30min. ~ 30min.
- Test cycle : 500 cycles
- Not operating : -



(4) Test Method

Before the test, check if there is no abnormal output and put the PSUT in the testing chamber. Then test it in above cycles. After the test is completed, leave it for 1 hour at the room temperature and check to make sure that there is no abnormal output.

(5) Test Results **Visually and electrically OK**