DRF480-24-1

RELIABILITY DATA

TDK-Lambda

PA620-57-01

INDEX

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

1. Calculated values for MTBF

MODEL : DRF480-24-1

1. Calculating Method

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

Formula :

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

where :

$\lambda equip$ = Total Equipment Failure Rate (Failure / 10^6 Hours)

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

G_F : (GROUND, FIXED)

MTBF = 112,108 (Hours)

2. Component derating

MODEL : DRF480-24-1

(1) Calculating method

(a) Measuring Conditions

Input	:	115VAC, 230VAC	Ambient temperature	:	60°C
Output	:	24V, 20A (100%)	Mounting method	:	Standard Mounting

(b) Semiconductors

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

(c) IC, Resistors, Capacitors, etc.

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 : DRF480-24-1

Location No.	Vin = 115VAC	Load = 100%	Ta = 60°C
Q11	Tjmax = 150°C,	θ j-c = 0.66°C/W	
STW38N65M5	Pd = 2.62W,	Δ Tc = 45.6°C	Tc = 105.6°C
STMICRO	Tj = Tc + ((θ j-c) × Pd) = 107.3°C D.F. = 71.55%		
Q12	Tjmax = 150°C,	θ j-c = 0.66°C/W	
STW38N65M5	Pd = 2.62W,	Δ Tc = 46°C	Tc = 106°C
STMICRO	Tj = Tc + ((θ j-c) × Pd) = 107.7°C D.F. = 71.82%		
Q101	Tjmax = 150°C,	θ j-c = 0.83°C/W	
IPP60R190C6	Pd = 1.92W,	Δ Tc = 39.5°C	Tc = 99.5°C
INFINEON	Tj = Tc + ((θ j-c) × Pd) = 101.1°C D.F. = 67.4%		
Q102	Tjmax = 150°C,	θ j-c = 0.83°C/W	
IPP60R190C6	Pd = 1.98W,	Δ Tc = 37.6°C	Tc = 97.6°C
INFINEON	Tj = Tc + ((θ j-c) × Pd) = 99.2°C D.F. = 66.16%		
Q201	Tjmax = 175°C,	θj-c = 0.44°C/W	Pd(max) = 338W
PSMN4R3-100PS,127	Pd = 0.21W,	Δ Tc = 38.7°C	Tc = 98.7°C
NXP	Tj = Tc + ((θ j-c) × Pd) = 98.8°C D.F. = 56.45%		
Q202	Tjmax = 175°C,	θ j-c = 0.44°C/W	Pd(max) = 338W
PSMN4R3-100PS,127	Pd = 0.23W,	Δ Tc = 42°C	Tc = 102°C
NXP	Tj = Tc + ((θ j-c) × Pd) = 102.1°C D.F. = 58.34%		
D11	Tjmax = 150°C,	θ j-c = 0.8°C/W	
LL25XB60-7000	Pd = 7.56W,	Δ Tc = 43.9°C	Tc = 103.9°C
SHINDENGEN	Tj = Tc + ((θ j-c) × Pd) = 109.95°C D.F. = 73.3%		
D14	Tjmax = 175°C,	θ j-c = 4.4°C/W	
SCS208AMC	Pd = 0.899W,	Δ Tc = 49.3°C	Tc = 109.3°C
ROHM	Tj = Tc + ((θ j-c) × Pd) = 113.25°C D.F. = 64.71%		
D402	Tjmax = 150°C,	θ j-l = 20°C/W	
CRF02(TE85L,Q)	Pd = 0.078W,	Δ Tl = 44.4°C	Tl = 104.4°C
TOSHIBA	Tj = Tl + ((θ j-l) × Pd) = 105.96°C D.F. = 70.64%		
D404	Tjmax = 150°C,	θ j-a = 65°C/W	
CRH01(TE85L,Q)	Pd = 0.19W,	Δ Ta = 44.4°C	Ta = 104.4°C
TOSHIBA	Tj = Ta + ((θ j-a) × Pd) = 116.63°C D.F. = 77.75%		

(2) Component Derating List

MODEL : DRF480-24-1

Location No.	Vin = 115VAC Load = 100% Ta = 60°C		
PC201 PS2861B-1Y-F3-A(L) RENESAS	Tjmax = 125°C, Pd = 0.00082W, Tj = Tc + ((θ j-c) × Pd) = 95.72°C D.F. = 76.58%	θ j-c = 150°C/W Δ Tc = 35.6°C	Tc = 95.6°C
PC202 PS2861B-1Y-F3-A(L) RENESAS	Tjmax = 125°C, Pd = 0W, Tj = Tc + ((θ j-c) × Pd) = 96.6°C D.F. = 77.28%	θ j-c = 150°C/W Δ Tc = 36.6°C	Tc = 96.6°C
PC401 PS2861B-1Y-F3-A(L) RENESAS	Tjmax = 125°C, Pd = 0.0061W, Tj = Tc + ((θ j-c) × Pd) = 95.41°C D.F. = 76.33%	θ j-c = 150°C/W Δ Tc = 34.5°C	Tc = 94.5°C
A11 UCC28061DR TI	Tjmax = 125°C, Pd = 0.1168W, Tj = Tc + ((θ j-c) × Pd) = 102.34°C D.F. = 81.87%	θj-a = 24.9°C/W ΔTc = 40.6°C	Tc = 100.6°C
A101 L6699DTR STMICRO	Tjmax = 150°C, Pd = 0.055W, Tj = Tc + ((θ j-c) × Pd) = 108.34°C D.F. = 72.23%	θ j-c = 120°C/W Δ Tc = 41.8°C	Tc = 101.8°C
A201 TEA1791AT/N1,118 NXP	Tjmax = 150°C, Pd = 0.15W, Tj = Tc + ((θ j-c) × Pd) = 118.34°C D.F. = 78.89%	θ j-c = 95°C/W Δ Tc = 43.7°C	Tc = 103.7°C
A202 TEA1791AT/N1,118 NXP	Tjmax = 150°C, Pd = 0.15W, Tj = Tc + ((θ j-c) × Pd) = 115.14°C D.F. = 76.76%	θ j-c = 95°C/W Δ Tc = 40.5°C	Tc = 100.5°C
A402 ICE3B0565JG INFINEON	Tjmax = 150°C, Pd = 0.413W, Tj = Tc + ((θ j-c) × Pd) = 114.3 °C D.F. = 76.21%	θ j-c = 24°C/W Δ Tc = 44.4°C	Tc = 104.4°C

(2) Component Derating List

MODEL : DRF480-24-1

Location No.	Vin = 230VAC	Load = 100%	Ta = 60°C
Q11	Tjmax = 150°C,	θ j-c = 0.66°C/W	
STW38N65M5	Pd = 1.64W,	Δ Tc = 39.1°C	Tc = 99.1°C
STMICRO	Tj = Tc + ((θ j-c) × Pd) = 100.2°C D.F. = 66.79%		
Q12	Tjmax = 150°C,	θ j-c = 0.66°C/W	
STW38N65M5	Pd = 1.64W,	Δ Tc = 39.3°C	Tc = 99.3°C
STMICRO	Tj = Tc + ((θ j-c) × Pd) = 100.4°C D.F. = 66.92%		
Q101	Tjmax = 150°C,	θ j-c = 0.83°C/W	
IPP60R190C6	Pd = 1.92W,	Δ Tc = 36.3°C	Tc = 96.3°C
INFINEON	Tj = Tc + ((θ j-c) × Pd) = 97.9°C D.F. = 65.26%		
Q102	Tjmax = 150°C,	θ j-c = 0.83°C/W	150.6W
IPP60R190C6	Pd = 1.98W,	Δ Tc = 35°C,	Tc = 95°C
INFINEON	Tj = Tc + ((θ j-c) × Pd) = 96.6°C D.F. = 64.43%		
Q201	Tjmax = 175°C,	θj-c = 0.44°C/W	Pd(max) = 338W
PSMN4R3-100PS,127	Pd = 0.21W,	Δ Tc = 38.1°C,	Tc = 98.1°C
NXP	Tj = Tc + ((θ j-c) × Pd) = 98.2°C D.F. = 56.11%		
Q202	Tjmax = 175°C,	θ j-c = 0.44°C/W	Pd(max) = 338W
PSMN4R3-100PS,127	Pd = 0.23W,	Δ Tc = 41.4°C	Tc = 101.4°C
NXP	Tj = Tc + ((θ j-c) × Pd) = 101.9°C D.F. = 58.24%		
D11	Tjmax = 150°C,	θ j-c = 0.8°C/W	
LL25XB60-7000	Pd = 3.75W,	Δ Tc = 29.4°C	Tc = 89.4°C
SHINDENGEN	Tj = Tc + ((θ j-c) × Pd) = 92.4°C D.F. = 61.6%		
D14	Tjmax = 175°C,	θ j-c = 4.4°C/W	
SCS208AMC	Pd = 0.899W,	Δ Tc = 41.6°C	Tc = 101.6°C
ROHM	Tj = Tc + ((θ j-c) × Pd) = 105.55°C D.F. = 60.32%		
D402	Tjmax = 150°C,	θ j-l = 20°C/W	
CRF02(TE85L,Q)	Pd = 0.078W,	Δ Tl = 41.9°C	Tl = 101.9°C
TOSHIBA	Tj = Tl + ((θ j-l) × Pd) = 103.46°C D.F. = 68.97%		
D404	Tjmax = 150°C,	θ j-a = 65°C/W	
CRH01(TE85L,Q)	Pd = 0.19W,	Δ Ta = 41.9°C	Ta = 101.9°C
TOSHIBA	Tj = Ta + ((θ j-a) × Pd) = 114.13°C D.F. = 76.09%		

(2) Component Derating List

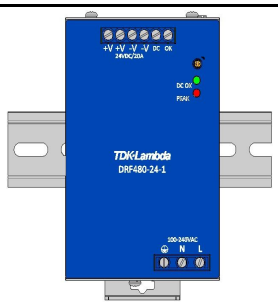
MODEL : DRF480-24-1

Location No.	Vin = 230VAC Load = 100% Ta = 60°C		
PC201 PS2861B-1Y-F3-A(L) RENESAS	Tjmax = 125°C, Pd = 0.00082W, Tj = Tc + ((θ j-c) × Pd) = 95.02°C D.F. = 76.02%	θ j-c = 150°C/W Δ Tc = 34.9°C	Tc = 94.9°C
PC202 PS2861B-1Y-F3-A(L) RENESAS	Tjmax = 125°C, Pd = 0W, Tj = Tc + ((θ j-c) × Pd) = 95.1°C D.F. = 76.08%	150°C/W Δ Tc = 35.1°C	Tc = 95.1°C
PC401 PS2861B-1Y-F3-A(L) RENESAS	Tjmax = 125°C, Pd = 0.0061W, Tj = Tc + ((θ j-c) × Pd) = 95.51°C D.F. = 76.41%	θ j-c = 150°C/W Δ Tc = 34.6°C	Tc = 94.6°C
A11 UCC28061DR TI	Tjmax = 125°C, Pd = 0.1168W, Tj = Tc + ((θ j-c) × Pd) = 95.84°C D.F. = 76.67%	θj-a = 24.9°C/W ΔTc = 34.1°C	Tc = 94.1°C
A101 L6699DTR STMICRO	Tjmax = 150°C, Pd = 0.055W, Tj = Tc + ((θ j-c) × Pd) = 107.74°C D.F. = 71.83%	θ j-c = 120°C/W Δ Tc = 41.2°C	Tc = 101.2°C
A201 TEA1791AT/N1,118 NXP	Tjmax = 150°C, Pd = 0.15W, Tj = Tc + ((θ j-c) × Pd) = 117.54°C D.F. = 78..36%	θ j-c = 95°C/W Δ Tc = 42.9°C	Tc = 102.9°C
A202 TEA1791AT/N1,118 NXP	Tjmax = 150°C, Pd = 0.15W, Tj = Tc + ((θ j-c) × Pd) = 114.04°C D.F. = 76.03%	θ j-c = 95°C/W Δ Tc = 39.4°C	Tc = 99.4°C
A402 ICE3B0565JG INFINEON	Tjmax = 150°C, Pd = 0.413W, Tj = Tc + ((θ j-c) × Pd) = 111.81 °C D.F. = 74.54%	θ j-c = 24°C/W Δ Tc = 41.9°C	Tc = 101.9°C

3. Main components temperature rise ΔT list

MODEL : DRF480-24-1

Condition:

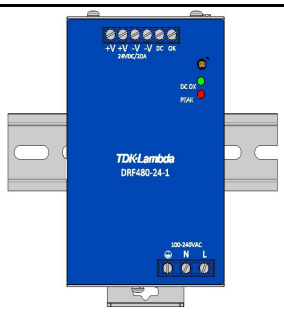
Standard Mounting Mounting Method (A)	
Input Voltage (VAC)	115
Output Voltage (VAC)	24
Output Current (A)	20

Output Derating		DT Temperature rise (°C)	
		Io = 100% (Ta = 60°C)	Io = 75% (Ta = 70°C)
Location No	Parts Name	Mounting (A)	Mounting (A)
L11	BALUN COIL	43.5	34.0
L12	BALUN COIL	48.4	37.3
L17	CHOKE COIL	63.2	49.7
T101	TRANS. PULSE	64.3	49.4
T401	TRANS. PULSE	34.6	29.6
D11	BRIDGE DIODE	43.9	33.8
D14	DIODE	49.3	45.8
Q11	MOS FET	45.6	34.0
Q12	MOS FET	46.0	37.4
Q101	MOS FET	39.5	31.5
Q102	MOS FET	37.6	30.7
Q201	MOS FET	38.7	34.6
Q202	MOS FET	42.0	35.4
A11	CHIP IC	40.6	33.8
A101	CHIP IC	41.8	38.8
A201	CHIP IC	43.7	39.9
A202	CHIP IC	40.5	36.1
A402	CHIP IC	44.4	40.8
PC201	CHIP OPTO COUPLER	35.6	32.7
PC202	CHIP OPTO COUPLER	36.6	33.0
PC401	CHIP OPTO COUPLER	34.5	32.3
C122	E. CAP	42.6	37.1
C208	E. CAP	35.3	28.8
C209	E. CAP	35.3	28.8
C210	E. CAP	27.7	24.9
C301	E. CAP	23.2	16.8
C409	E. CAP	40.1	35.9
C412	E. CAP	37.4	33.6
C416	E. CAP	37.6	30.1
C501	FILM CAP	20.9	20.9

3. Main components temperature rise ΔT list

MODEL : DRF480-24-1

Condition:

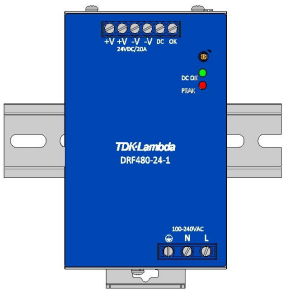
Standard Mounting Mounting Method (A)	
Input Voltage (VAC)	230
Output Voltage (VAC)	24
Output Current (A)	20

Output Derating		DT Temperature rise (°C)	
		Io = 100% (Ta = 60°C)	Io = 75% (Ta = 70°C)
Location No	Parts Name	Mounting (A)	Mounting (A)
L11	BALUN COIL	30.9	27.9
L12	BALUN COIL	32.5	27.8
L17	CHOKE COIL	43.5	38.7
T101	TRANS. PULSE	61.8	48.2
T401	TRANS. PULSE	33.4	28.1
D11	BRIDGE DIODE	29.4	24.3
D14	DIODE	41.6	38.0
Q11	MOS FET	39.1	34.3
Q12	MOS FET	39.3	37.5
Q101	MOS FET	36.3	29.3
Q102	MOS FET	35.0	28.7
Q201	MOS FET	38.1	32.7
Q202	MOS FET	41.4	34.2
A11	CHIP IC	34.1	31.9
A101	CHIP IC	41.2	36.1
A201	CHIP IC	42.9	38.4
A202	CHIP IC	39.4	34.4
A402	CHIP IC	41.9	38.5
PC201	CHIP OPTO COUPLER	34.9	30.9
PC202	CHIP OPTO COUPLER	35.1	31.0
PC401	CHIP OPTO COUPLER	34.6	30.5
C122	E. CAP	36.1	32.8
C208	E. CAP	34.2	27.7
C209	E. CAP	34.2	27.7
C210	E. CAP	27.8	24.0
C301	E. CAP	23.1	15.8
C409	E. CAP	37.9	33.1
C412	E. CAP	35.6	30.8
C416	E. CAP	37.4	28.9
C501	FILM CAP	19.8	19.8

4. Electrolytic capacitor lifetime

MODEL : DRF480-24-1

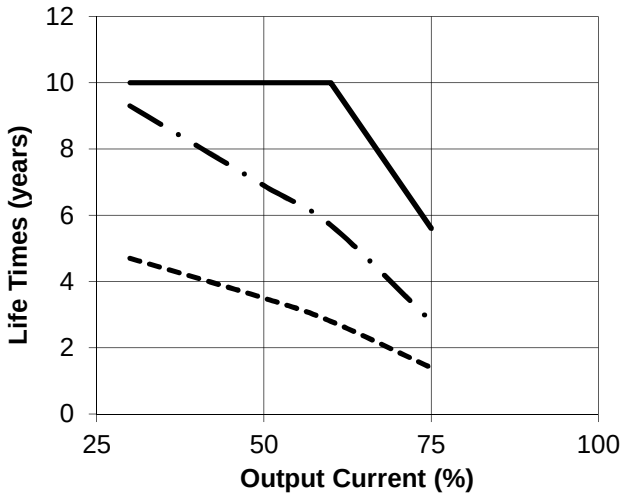
Standard Mounting



Ta = 40°C
= 50°C
= 60°C

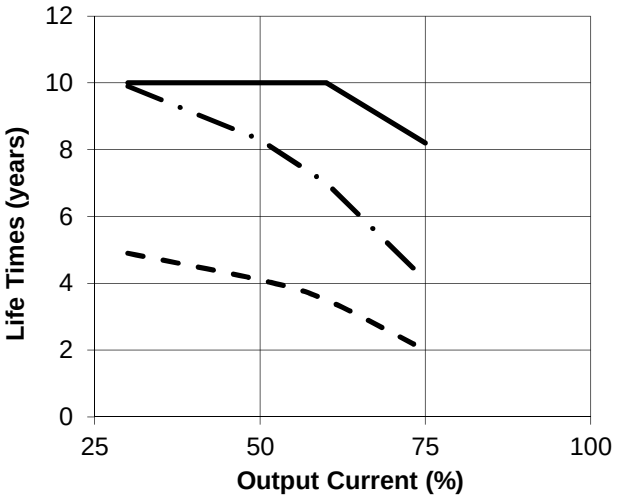
Vin = 115VAC

Load (%)	Life Time (years)		
	Ta = 40°C	Ta = 50°C	Ta = 60°C
30	10.0	9.3	4.7
50	10.0	6.9	3.5
60	10.0	5.7	2.8
75	5.6	2.8	1.4



Vin = 230VAC

Load (%)	Life Time (years)		
	Ta = 40°C	Ta = 50°C	Ta = 60°C
30	10.0	9.9	4.9
50	10.0	8.3	4.1
60	10.0	7.0	3.5
75	8.2	4.1	2.0



5. Vibration Test

MODEL : DRF480-24-1

(1) Vibration Test Class

Frequency Variable Endurance Test

(2) Equipment Used

Controller	:	Laser USB (DACTRON) SN: 7184823
Vibrator	:	LDS V8-440 (Ling Dynamics)
Accelerometer	:	3255A4 (Dytran) SN: 11125

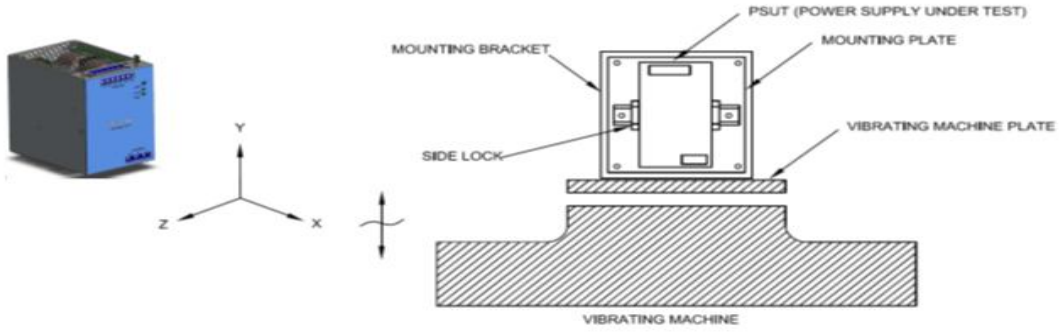
(3) The Number Of D.U.T. (Device Under Test)

1 Unit

(4) Test Conditions

Sweep Frequency	:	10 - 55Hz	Direction	:	X, Y, Z
Sweep Time	:	1 minute	Test Time	:	1 hour each axis
Acceleration	:	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 - OK

7. Abnormal test

MODEL : DRF480-24-1

(1) Test Condition and Circuit

Input Voltage: 230Vac Output: 24V, 20A 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.V.P.	9 O.C.P.	10 NO OUTPUT	11 NO CHANGE	12 OTHERS	NOTE
1	Q11	G-D	○							○	○			○			Da:Q11,A11,Z11
		G-S	○													○	Pin Increase
		D-S	○								○			○			
		G		○						○	○			○			Da:Q11
		D		○												○	Pin Increase
		S		○												○	Pin Increase
2	Q12	G-D	○							○	○			○			Da:Q12,A11,Z12
		G-S	○													○	Hiccup
		D-S	○								○			○			
		G		○						○	○			○			Da:Q12
		D		○												○	Pin Increase
		S		○												○	Pin Increase
3	Q101	G-D	○							○	○			○			Da:Q101,Q102,A101
		G-S	○											○			
		D-S	○							○	○			○			Da:Q102,A101
		G		○						○	○			○			Da:Q101,Q102,A101
		D		○										○			
		S		○										○			
4	Q102	G-D	○							○				○			Da:A101
		G-S	○											○			
		D-S	○											○			
		G		○										○			
		D		○										○			
		S		○										○			
5	Q201	G-D	○											○			
		G-S	○													○	Pin increase
		D-S	○													○	Hiccup
		G		○												○	Pin increase
		D		○										○			
		S		○										○			
6	Q202	G-D	○											○			
		G-S	○													○	Pin increase
		D-S	○													○	Hiccup
		G		○												○	Pin increase
		D		○										○			
		S		○										○			

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.V.P.	O.C.P.	NO OUTPUT	NO CHANGE	OTHERS	NOTE
7	D11	1-2	○								○			○			
		2-3	○								○			○			
		3-4	○								○			○			
		1		○										○			
		2		○										○			
		3		○										○			
		4		○										○			
8	D12	A-K	○												○		
		A-K		○												○	Power factor decrease
9	D13	A-K	○													○	Power factor decrease
		A-K		○						○	○			○			Da:Q12,D14
10	D402	A-K	○											○			
		A-K		○												○	VDS Increase
11	D404	A-K	○											○			
		A-K		○										○			
12	PC201	1-2	○									○					
		3-4	○											○			
		1		○								○					
		2		○								○					
		3		○								○					
		4		○								○					
13	PC202	1-2	○												○		
		3-4	○											○			
		1		○											○		
		2		○											○		
		3		○											○		
		4		○											○		
14	PC401	1-2	○											○			
		3-4	○													○	CNT on/off cant operate
		1		○										○			
		2		○										○			
		3		○										○			
		4		○										○			
15	A11	1-2	○													○	Pin Increase
		2-3	○													○	Pin Increase
		3-4	○													○	Pin Increase
		4-5	○													○	Vout goes down
		5-6	○													○	Vout goes down
		6-7	○													○	Vout goes down
		7-8	○												○		
		9-10	○												○		
		10-11	○											○			
		11-12	○							○	○			○			Da:Q12
		12-13	○											○			
		13-14	○													○	Pin Increase
		14-15	○													○	Vout goes down
		15-16	○													○	Vout goes down

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.V.P.	O.C.P.	NO OUTPUT	NO CHANGE	OTHERS	NOTE
15	A11	1		○												○	Pin Increase
		2		○												○	Vout goes down
		3		○												○	Pin Increase
		4		○											○		
		5		○												○	Pin Increase
		6		○												○	Vout goes down
		7		○												○	Hizzing soundd heard
		8		○												○	Vout goes down
		9		○											○		
		10		○												○	PFC OCP can't operate
		11		○												○	Pin Increase
		12		○												○	Vout goes down
		13		○											○		
		14		○												○	Pin Increase
		15		○											○		
		16		○												○	Pin Increase
16	A101	1-2	○													○	Vout Hiccup
		2-3	○											○			
		3-4	○											○			
		4-5	○									○					
		5-6	○											○			
		6-7	○											○			
		7-8	○											○			
		9-10	○												○		
		10-11	○											○			
		11-12	○							○	○			○			Da:Q101,102
		12-13	○												○		
		13-14	○												○		
		14-15	○											○			
		15-16	○											○			
		1		○											○		
		2		○										○			
		3		○												○	Vout Hiccup
		4		○												○	Vout Hiccup
		5		○										○			
		6		○										○			
		7		○										○			
		8		○												○	OTP & OVP can't operate
		9		○											○		
		10		○										○			
		11		○										○			
		12		○										○			
		13		○											○		
		14		○						○	○			○			
		15		○						○	○			○			
		16		○												○	Vo hiccup

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.V.P.	O.C.P.	NO OUTPUT	NO CHANGE	OTHERS	NOTE
17	A201	1-2	○													○	Pin Increase
		2-3	○												○		
		3-4	○												○		
		5-6	○												○		
		6-7	○												○		
		7-8	○												○		
		1		○												○	Pin Increase
		2		○												○	Pin Increase
		3		○											○		
		4		○												○	Pin Increase
		5		○											○		
		6		○											○		
		7		○											○		
		8		○												○	Pin Increase
18	A202	1-2	○													○	Pin Increase
		2-3	○												○		
		3-4	○												○		
		5-6	○												○		
		6-7	○												○		
		7-8	○												○		
		1		○												○	Pin Increase
		2		○												○	Pin Increase
		3		○											○		
		4		○												○	Pin Increase
		5		○											○		
		6		○											○		
		7		○											○		
		8		○												○	Pin Increase
19	A402	1-2	○												○		
		2-3	○												○		
		3-4	○											○			
		4-5	○							○				○			Da:R409,R404
		5-6	○												○		
		7-8	○												○		
		8-9	○												○		
		9-10	○												○		
		10-11	○												○		
		11-12	○											○			
		1		○											○		
		2		○										○			
		3		○										○		○	Vout Hiccup
		4		○										○			
		5		○											○		
		6		○											○		
		7		○											○		
		8		○											○		
		9		○											○		
		10		○											○		
		11		○										○			
		12		○											○		

7. Thermal shock test

MODEL : DRF480-24-1

(1) Equipment used

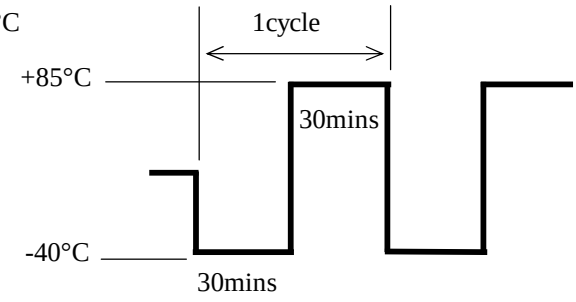
Thermal shock chamber (ESPEC CORP.)

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

1 unit

(3) Test Conditions

- Ambient temperature : -40°C ⟷ +85°C
- Test time : 30min each temp.
- Test cycle : 200 cycles
- Operating : No 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 OK