

HFE2500

RELIABILITY DATA

DWG: IA689-79-01		
APPD	CHK	DWG
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The above data is typical value. As all units have nearly the same characteristics, the data to be considered as ability value.

1. M.T.B.F**1.1 Method of calculation according to Telcordia (Bellcore):**

Limited Stress - Method I, Case 3, Ambient temperature-25°C, GB (Ground,Benign)
Individual failure rates is given to each part and M.T.B.F is calculated by
the count of each part

$$\lambda = \sum_{i=1}^n \lambda_i \qquad MTBF = \frac{1}{\lambda}$$

where:

λ_i failure rate of I's item

n number of item

1.2 M.T.B.F Values according to Telcordia (Bellcore)

$$\underline{M.T.B.F = 219,557 \text{ (HOURS)}}$$

1.3 Method of calculation according to JEITA (RCR-9102)

Based on part count reliability projection of MIL-HDBK-217F, GF (Ground,Fixed)
Individual failure rates is given to each part and M.T.B.F is
calculated by the count of each part.

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

Where:

- λ_{equip} = Total Equipment Failure Rate (Failures / 10^6 Hours)
- λ_G = Generic Failure Rate For The it Generic Part (Failure / 10^6 Hours)
- N_i = Quantity of it Generic Part
- n = Number of Different Generic Part Categories
- π_Q = Generic Quality factor for the Generic Part ($\pi_Q = 1$)

1.4 M.T.B.F Value according to JEI TA (RCR-9102)

$$\underline{M.T.B.F = 32,913(HOURS)}$$

2.COMPONENT DERATING

Calculation method

a) Condition

Output: Vout - 100%, Iout - 100%
 Ambient temperature: 50°C
 Mounting Method: Standard (horizontal) mounting

b) Semiconductors

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

c) Semiconductors, Resistors, Capacitors, etc.

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

d) Calculation method of thermal impedance

$$\theta_{j-c} = \frac{T_j(\max) - T_c}{P_c(\max)} \quad \theta_{j-a} = \frac{T_j(\max) - T_a}{P_c(\max)} \quad \theta_{j-l} = \frac{T_j(\max) - T_l}{P_c(\max)}$$

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

P_c(max): Maximum Power Dissipation

T_j(max): Maximum Junction temperature

θ_{j-c}: Thermal Impedance between Junction and Case

θ_{j-a}: Thermal Impedance between Junction and Air

θ_{j-l}: Thermal Impedance between Junction and Lead

(2) Component derating list

Location №	Vin=230VAC		Load = 100%		Ta=50°C	
A107	Tjmax=	150 °C	θ_{j-c} =	3.0 °C/W		
MIP2E5DMY	Pd =	3.5 W	ΔT_c =	28.8 °C	Tc =	78.8 °C
PANASONIC	Tj = Tc + ($\theta_{j-c} \times Pd$) =		89.3 °C		D.F. =	59.5 %
A104	Tjmax=	150 °C	θ_{j-c} =	42.0 °C/W		
MC33063AD	Pd =	0.75 W	ΔT_c =	42.9 °C	Tc =	92.9 °C
TI	Tj = Tc + ($\theta_{j-c} \times Pd$) =		124.4 °C		D.F. =	82.9 %
A401	Tjmax=	125 °C	θ_{j-a} =	140.0 °C/W		
UCC28061D	Pd =	0.067 W	ΔT_a =	14.6 °C	Ta =	64.6 °C
TI	Tj = Ta + ($\theta_{j-a} \times Pd$) =		74.0 °C		D.F. =	59.2 %
A403	Tjmax=	150 °C	θ_{j-a} =	250.0 °C/W		
FA13843NHLTP-EL-E	Pd =	0.035 W	ΔT_a =	14.0 °C	Ta =	64.0 °C
FUJI	Tj = Ta + ($\theta_{j-a} \times Pd$) =		72.8 °C		D.F. =	48.5 %
A601	Tjmax=	150 °C	θ_{j-a} =	200.0 °C/W		
LM5033MM NOPB	Pd =	0.1 W	ΔT_a =	24.0 °C	Ta =	74.0 °C
NATIONAL SEMI	Tj = Ta + ($\theta_{j-a} \times Pd$) =		94.0 °C		D.F. =	62.7 %
A602	Tjmax=	125 °C	θ_{j-a} =	286.0 °C/W		
TPS2819DBVR	Pd =	0.1 W	ΔT_a =	25.4 °C	Ta =	75.4 °C
TI	Tj = Ta + ($\theta_{j-a} \times Pd$) =		104.0 °C		D.F. =	83.2 %
A603	Tjmax=	125 °C	θ_{j-a} =	286.0 °C/W		
TPS2819DBVR	Pd =	0.1 W	ΔT_a =	24.0 °C	Ta =	74.0 °C
TI	Tj = Ta + ($\theta_{j-a} \times Pd$) =		102.6 °C		D.F. =	82.1 %
A651	Tjmax=	150 °C	θ_{j-a} =	200.0 °C/W		
LM5033MM NOPB	Pd =	0.1 W	ΔT_a =	15.0 °C	Ta =	65.0 °C
NATIONAL SEMI	Tj = Ta + ($\theta_{j-a} \times Pd$) =		85.0 °C		D.F. =	56.7 %
A652	Tjmax=	150 °C	θ_{j-a} =	200.0 °C/W		
LM5102MM	Pd =	0.1 W	ΔT_a =	16.0 °C	Ta =	66.0 °C
NATIONAL SEMI	Tj = Ta + ($\theta_{j-a} \times Pd$) =		86.0 °C		D.F. =	57.3 %
A653	Tjmax=	150 °C	θ_{j-a} =	200.0 °C/W		
LM5102MM	Pd =	0.1 W	ΔT_a =	15.0 °C	Ta =	65.0 °C
NATIONAL SEMI	Tj = Ta + ($\theta_{j-a} \times Pd$) =		85.0 °C		D.F. =	56.7 %
A701	Tjmax=	125 °C	θ_{j-a} =	200.0 °C/W		
LTC43571MS8#TRPBF	Pd =	0.03 W	ΔT_a =	34.4 °C	Ta =	84.4 °C
LINEAR	Tj = Ta + ($\theta_{j-a} \times Pd$) =		90.2 °C		D.F. =	72.2 %
A801	Tjmax=	150 °C	θ_{j-c} =	42.0 °C/W		
MC33063AD	Pd =	0.5 W	ΔT_c =	54.8 °C	Tc =	104.8 °C
TI	Tj = Tc + ($\theta_{j-c} \times Pd$) =		125.8 °C		D.F. =	83.9 %

Location №	Vin=230VAC	Load = 100%	Ta=50°C
D101 GBJ2506-F DIODES	Tjmax= 150 °C Pd = 14 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.6 °C/W ΔT_c = 50.2 °C 108.6 °C	Tc = 100.2 °C D.F. = 72.4 %
D107 YG912S6RR FUJI	Tjmax= 150 °C Pd = 4.3 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 3.5 °C/W ΔT_c = 42.8 °C 107.9 °C	Tc = 92.8 °C D.F. = 71.9 %
D108 YG912S6RR FUJI	Tjmax= 150 °C Pd = 4.3 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 3.5 °C/W ΔT_c = 49.2 °C 114.3 °C	Tc = 99.2 °C D.F. = 76.2 %
D109 IDH12SG60C INFINEON	Tjmax= 150 °C Pd = 4.2 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 1.2 °C/W ΔT_c = 57.3 °C 112.3 °C	Tc = 107.3 °C D.F. = 74.9 %
Q101 IPW60R075CP INFINEON	Tjmax= 150 °C Pd = 10 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.4 °C/W ΔT_c = 30.8 °C 84.8 °C	Tc = 80.8 °C D.F. = 56.5 %
Q102 IPW60R075CP INFINEON	Tjmax= 150 °C Pd = 10 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.4 °C/W ΔT_c = 38.0 °C 92.0 °C	Tc = 88.0 °C D.F. = 61.3 %
Q103 IPW60R075CP INFINEON	Tjmax= 150 °C Pd = 12.3 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.4 °C/W ΔT_c = 64.1 °C 119.0 °C	Tc = 114.1 °C D.F. = 79.3 %
Q104 IPW60R075CP INFINEON	Tjmax= 150 °C Pd = 12.3 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.4 °C/W ΔT_c = 54.5 °C 109.4 °C	Tc = 104.5 °C D.F. = 72.9 %
Q113 IPW60R075CP INFINEON	Tjmax= 150 °C Pd = 4.0 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.4 °C/W ΔT_c = 52.4 °C 104.0 °C	Tc = 102.4 °C D.F. = 69.3 %
Q114 IPW60R075CP INFINEON	Tjmax= 150 °C Pd = 4.0 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.4 °C/W ΔT_c = 46.9 °C 98.5 °C	Tc = 96.9 °C D.F. = 65.7 %
Q121 IPW60R075CP INFINEON	Tjmax= 150 °C Pd = 4.0 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.4 °C/W ΔT_c = 36.8 °C 88.4 °C	Tc = 86.8 °C D.F. = 58.9 %
Q122 IPW60R075CP INFINEON	Tjmax= 150 °C Pd = 4.0 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.4 °C/W ΔT_c = 57.6 °C 109.2 °C	Tc = 107.6 °C D.F. = 72.8 %

12V

Location №	Vin=230VAC	Load = 100%	Ta=50°C
Q501(R) BSC017N04NS G INFINEON	Tjmax= 150 °C Pd = 1.2 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.9 °C/W ΔT_c = 40.8 °C 91.9 °C	Tc = 90.8 °C D.F. = 61.3 %
Q502(R) BSC017N04NS G INFINEON	Tjmax= 150 °C Pd = 1.2 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.9 °C/W ΔT_c = 39.6 °C 90.7 °C	Tc = 89.6 °C D.F. = 60.5 %
Q503(R) BSC017N04NS G INFINEON	Tjmax= 150 °C Pd = 1.2 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.9 °C/W ΔT_c = 38.1 °C 89.2 °C	Tc = 88.1 °C D.F. = 59.5 %
Q504(R) BSC017N04NS G INFINEON	Tjmax= 150 °C Pd = 1.2 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.9 °C/W ΔT_c = 33.9 °C 85.0 °C	Tc = 83.9 °C D.F. = 56.7 %
Q505(R) BSC017N04NS G INFINEON	Tjmax= 150 °C Pd = 1.2 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.9 °C/W ΔT_c = 34.8 °C 85.9 °C	Tc = 84.8 °C D.F. = 57.3 %
Q506(R) BSC017N04NS G INFINEON	Tjmax= 150 °C Pd = 1.2 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.9 °C/W ΔT_c = 32.9 °C 84.0 °C	Tc = 82.9 °C D.F. = 56.0 %
Q501(L) BSC017N04NS G INFINEON	Tjmax= 150 °C Pd = 1.2 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.9 °C/W ΔT_c = 41.5 °C 92.6 °C	Tc = 91.5 °C D.F. = 61.7 %
Q502(L) BSC017N04NS G INFINEON	Tjmax= 150 °C Pd = 1.2 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.9 °C/W ΔT_c = 46.2 °C 97.3 °C	Tc = 96.2 °C D.F. = 64.9 %
Q503(L) BSC017N04NS G INFINEON	Tjmax= 150 °C Pd = 1.2 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.9 °C/W ΔT_c = 47.2 °C 98.3 °C	Tc = 97.2 °C D.F. = 65.5 %
Q504(L) BSC017N04NS G INFINEON	Tjmax= 150 °C Pd = 1.2 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.9 °C/W ΔT_c = 48.6 °C 99.7 °C	Tc = 98.6 °C D.F. = 66.5 %
Q505(L) BSC017N04NS G INFINEON	Tjmax= 150 °C Pd = 1.2 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.9 °C/W ΔT_c = 49.3 °C 100.4 °C	Tc = 99.3 °C D.F. = 66.9 %
Q506(L) BSC017N04NS G INFINEON	Tjmax= 150 °C Pd = 1.2 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.9 °C/W ΔT_c = 54.9 °C 106.0 °C	Tc = 104.9 °C D.F. = 70.7 %

24V

Location №	Vin=230VAC	Load = 100%	Ta=50°C
Q501(R) BSC077N12NS3 INFINEON	Tjmax= 150 °C Pd = 1.5 W Tj = Tc + (θj-c x Pd) =	θj-c = 0.9 °C/W ΔTc = 70.1 °C 121.5 °C	Tc = 120.1 °C D.F. = 81.0 %
Q502(R) BSC077N12NS3 INFINEON	Tjmax= 150 °C Pd = 1.5 W Ij = 1 C T (θj-c x Pd) =	θj-c = 0.9 °C/W ΔTc = 76.4 °C 127.8 °C	Tc = 126.4 °C D.F. = 85.2 %
Q503(R) BSC077N12NS3 INFINEON	Tjmax= 150 °C Pd = 1.5 W Tj = Tc + (θj-c x Pd) =	θj-c = 0.9 °C/W ΔTc = 66.8 °C 118.2 °C	Tc = 116.8 °C D.F. = 78.8 %
Q504(R) BSC077N12NS3 INFINEON	Tjmax= 150 °C Pd = 1.5 W Tj = Tc + (θj-c x Pd) =	θj-c = 0.9 °C/W ΔTc = 69.9 °C 121.3 °C	Tc = 119.9 °C D.F. = 80.9 %
Q505(R) BSC077N12NS3 INFINEON	Tjmax= 150 °C Pd = 1.5 W Tj = Tc + (θj-c x Pd) =	θj-c = 0.9 °C/W ΔTc = 66.2 °C 117.6 °C	Tc = 116.2 °C D.F. = 78.4 %
Q506(R) BSC077N12NS3 INFINEON	Tjmax= 150 °C Pd = 1.5 W Tj = Tc + (θj-c x Pd) =	θj-c = 0.9 °C/W ΔTc = 47.1 °C 98.5 °C	Tc = 97.1 °C D.F. = 65.6 %
Q501(L) BSC077N12NS3 INFINEON	Tjmax= 150 °C Pd = 1.5 W Tj = Tc + (θj-c x Pd) =	θj-c = 0.9 °C/W ΔTc = 65.7 °C 117.1 °C	Tc = 115.7 °C D.F. = 78.1 %
Q502(L) BSC077N12NS3 INFINEON	Tjmax= 150 °C Pd = 1.5 W Tj = Tc + (θj-c x Pd) =	θj-c = 0.9 °C/W ΔTc = 61.0 °C 112.4 °C	Tc = 111.0 °C D.F. = 74.9 %
Q503(L) BSC077N12NS3 INFINEON	Tjmax= 150 °C Pd = 1.5 W Tj = Tc + (θj-c x Pd) =	θj-c = 0.9 °C/W ΔTc = 57.0 °C 108.4 °C	Tc = 107.0 °C D.F. = 72.2 %
Q504(L) BSC077N12NS3 INFINEON	Tjmax= 150 °C Pd = 1.5 W Tj = Tc + (θj-c x Pd) =	θj-c = 0.9 °C/W ΔTc = 49.7 °C 101.1 °C	Tc = 99.7 °C D.F. = 67.4 %
Q505(L) BSC077N12NS3 INFINEON	Tjmax= 150 °C Pd = 1.5 W Tj = Tc + (θj-c x Pd) =	θj-c = 0.9 °C/W ΔTc = 51.4 °C 102.8 °C	Tc = 101.4 °C D.F. = 68.5 %
Q506(L) BSC077N12NS3 INFINEON	Tjmax= 150 °C Pd = 1.5 W Tj = Tc + (θj-c x Pd) =	θj-c = 0.9 °C/W ΔTc = 51.1 °C 102.5 °C	Tc = 101.1 °C D.F. = 68.3 %

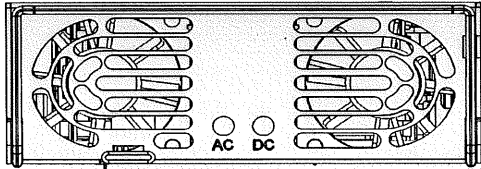
Location №	Vin=230VAC	Load = 100%	Ta=50°C
Q551	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC077N12NS3	Pd = 1.5 W	$\Delta T_c = 47.4$ °C	Tc = 97.4 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	98.8 °C	D.F. = 65.9 %
Q552	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC077N12NS3	Pd = 1.5 W	$\Delta T_c = 42.1$ °C	Tc = 92.1 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	93.5 °C	D.F. = 62.3 %
Q553	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC077N12NS3	Pd = 1.5 W	$\Delta T_c = 51.9$ °C	Tc = 101.9 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	103.3 °C	D.F. = 68.9 %
Q554	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC077N12NS3	Pd = 1.5 W	$\Delta T_c = 46.0$ °C	Tc = 96.0 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	97.4 °C	D.F. = 64.9 %
Q555	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC077N12NS3	Pd = 1.5 W	$\Delta T_c = 50.0$ °C	Tc = 100.0 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	101.4 °C	D.F. = 67.6 %
Q556	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC077N12NS3	Pd = 1.5 W	$\Delta T_c = 48.4$ °C	Tc = 98.4 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	99.8 °C	D.F. = 66.5 %
Q557	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC077N12NS3	Pd = 1.5 W	$\Delta T_c = 42.1$ °C	Tc = 92.1 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	93.5 °C	D.F. = 62.3 %
Q558	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC077N12NS3	Pd = 1.5 W	$\Delta T_c = 47.3$ °C	Tc = 97.3 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	98.7 °C	D.F. = 65.8 %
Q559	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC077N12NS3	Pd = 1.5 W	$\Delta T_c = 53.7$ °C	Tc = 103.7 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	105.1 °C	D.F. = 70.1 %
Q560	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC077N12NS3	Pd = 1.5 W	$\Delta T_c = 45.6$ °C	Tc = 95.6 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	97.0 °C	D.F. = 64.7 %
Q561	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC077N12NS3	Pd = 1.5 W	$\Delta T_c = 50.0$ °C	Tc = 100.0 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	101.4 °C	D.F. = 67.6 %
Q562	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC077N12NS3	Pd = 1.5 W	$\Delta T_c = 42.1$ °C	Tc = 92.1 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	93.5 °C	D.F. = 62.3 %

3.MAIN COMPONENTS TEMPERATURE RISE ΔT LIST

12V

Location No.	Parts Name	ΔT Temperature Rise ($^{\circ}\text{C}$)	
		115Vac	230Vac
A107	TOP SWITCH	24.4	27.0
A801	AUX REGULATOR	33.2	47.2
C101	"X" CAPACITOR	26.7	26.4
C108	ELEC. CAP.	12.3	14.9
C160	ELEC. CAP.	26.4	49.0
C180	ELEC. CAP.	24.6	38.7
D101	BRIDGE	52.4	47.2
D109	BUCK DIODE	46.0	54.3
L101	EMI CHOKE	58.4	45.4
L104	PF CHOKE	52.3	51.9
L105	BUCK CHOKE	27.0	53.1
Q101	PF MOSFET	46.1	30.8
Q103	BUCK MOSFET	47.1	57.3
Q122	DC-DC MOSFET	22.9	47.1
Q506	RECTIFIER	28.8	54.9
Q701	ORING MOSFET	29.6	51.6
T101	BIAS X'MER	22.0	24.4
T102	DRIVER X'MER	18.5	20.6
T104	DC-DC X'MER	38.0	62.7

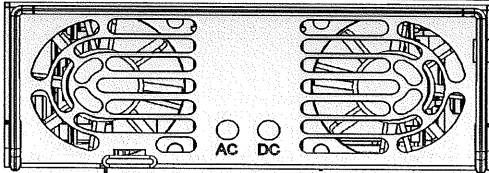
Conditions:

Standard Mounting		
Input Voltage	115VAC	230VAC
Output Voltage	12V	12V
Output Current	125A	200A
Ambient Temperature	50 $^{\circ}\text{C}$	

24V

Location No.	Parts Name	ΔT Temperature Rise (°C)	
		115Vac	230Vac
A107	TOP SWITCH	25.6	28.8
A801	AUX REGULATOR	35.7	51.2
C101	"X" CAPACITOR	27.2	26.7
C108	ELEC. CAP.	12.8	15.5
C160	ELEC. CAP.	30.4	53.7
C180	ELEC. CAP.	21.6	36.4
D101	BRIDGE	55.8	50.2
D109	BUCK DIODE	48.2	57.3
L101	EMI CHOKE	59.6	45.5
L104	PF CHOKE	33.8	23.9
L105	BUCK CHOKE	30.2	55.9
Q101	PF MOSFET	44.8	28.9
Q103	BUCK MOSFET	54.0	64.1
Q122	DC-DC MOSFET	27.8	57.6
Q502	RECTIFIER	38.7	76.4
Q701	ORING MOSFET	32.9	60.7
T101	BIAS X'MER	19.8	26.4
T102	DRIVER X'MER	16.2	22.3
T104	DC-DC X'MER	41.5	79.4

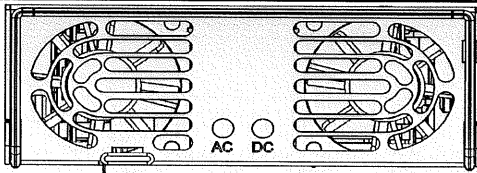
Conditions:

Standard Mounting		
Input Voltage	115VAC	230VAC
Output Voltage	24V	24V
Output Current	62A	104A
Ambient Temperature	50°C	

48V

Location No.	Parts Name	ΔT Temperature Rise (°C)	
		115Vac	230Vac
A107	TOP SWITCH	22.3	24.8
A801	AUX REGULATOR	46.0	54.8
C101	"X" CAPACITOR	22.1	24.2
C108	ELEC. CAP.	9.2	12.4
C160	ELEC. CAP.	19.0	31.9
C180	ELEC. CAP.	22.0	37.2
D101	BRIDGE	52.1	47.8
D109	BUCK DIODE	42.4	42.6
L101	EMI CHOKE	45.7	39.7
L104	PF CHOKE	31.5	25.9
L105	BUCK CHOKE	20.4	37.5
Q101	PF MOSFET	37.4	28.9
Q103	BUCK MOSFET	43.4	53.5
Q122	DC-DC MOSFET	23.7	37.7
Q559	RECTIFIER	27.4	55.7
Q701	ORING MOSFET	24.1	44.4
T101	BIAS X'MER	19.0	25.7
T102	DRIVER X'MER	15.5	21.2
T104	DC-DC X'MER	31.7	62.2

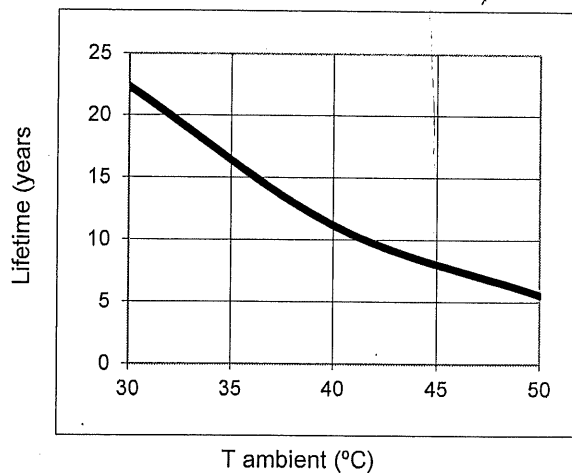
Conditions:

Standard Mounting		
Input Voltage	115VAC	230VAC
Output Voltage	48V	48V
Output Current	31A	52A
Ambient Temperature	50°C	

4.ELECTROLYTIC CAPACITORS LIFE TIME ESTIMATION

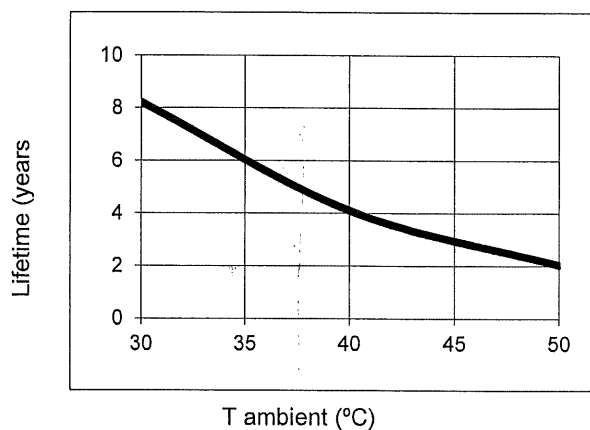
Vin=115Vac

MODEL	COMPUTED LIFE (year) at Tambient		
	30°C	40°C	50°C
HFE2500	22.33	11.17	5.58



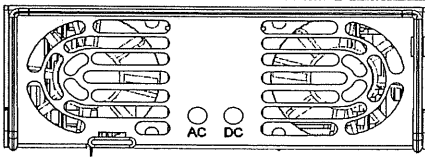
Vin=230Vac

MODEL	COMPUTED LIFE (year) at Tambient		
	30°C	40°C	50°C
HFE2500	8.22	4.11	2.05



FORMULA:
$$L = L_0 \times 2^{\frac{105 - T_C}{10}} \quad (\text{years})$$

L: Elec.capacitor computed life (24 hours per day,365 days operation)
 Lo: Guaranteed life for Elec.capacitor
 Tc: Case temperature of Elec.capacitor

Standard Mounting	
Output Voltage	100%
Output Current	100%

5. ABNORMAL TEST

HFE2500

Model:48V
Input:230VAC

Ta:25°C, 70% RH

Vout=48V
Iout=62A
(Da:Damaged)

№	Test Position		Test Mode		Test Result												Note
	Location №	Test Point	Short	Open	1	2	3	4	5	6	7	8	9	10	11	12	
					Fire	Smoke	Burst	Smell	Red Hot	Damaged	Fuse opened	O V P	O C O	No Output	No Change	Others	
1	D101	AC-DC	O							O	O			O			F101,D101
		AC-AC	O								O			O			F101
		AC		O											O		
		DC		O											O		
2	D106		O							O						O	R122, R123,R302 - open
				O											O		
3	D108		O							O	O			O			F101, Q102, PFC Control circuit
				O						O	O			O			F101, Q102
4	D109		O							O	O			O			F101, Q102, Q103, Q104, D107, D108
				O						O				O			D106, R122, R123, R302
5	D110		O							O				O			R103, Q103, Q104, D109
				O						O	O			O			F101, Q103, Q104,
6	D111		O							O				O			R103
				O											O		
7	D112		O													O	Input power increased by 50W, Audible noise.
				O						O						O	Vo up to 32.7V, Damage Q103
8	D113		O							O	O			O			F101, Q101, Q102, R109, PFC Control circuit
				O										O		O	A107 - Hicc-up
9	D114		O											O			
				O											O		
10	D117		O											O			A107 - Hicc-up
				O												O	Vo up to 32.7V
11	Q101	G-S	O													O	Q102 temp. rise increase from 45°C to 102°C
		D-S	O								O			O			F101
		D-G	O							O	O			O			F101, Q101, R408, R411, R412, Q402,
		S		O												O	Q102 temp. rise increase from 45°C to 102°C
		G		O						O	O			O			F101, Q101
		D		O												O	Q102 temp. rise increase from 45°C to 102°C
12	Q103	G-S	O											O		O	Pin=28W
		D-S	O							O	O					O	Vo up to 34V, after 20sec Da: F101, Q101
		D-G	O							O				O			Q103, Q113, Q114, Q121, Q122, R103
		S		O						O				O			ZD101, Q106, R444, R445, D404, A403
		G		O						O	O					O	Vo up to 34V, after 20sec Da: F101, Q101
		D		O						O	O					O	Q104 temp. rise over 150°C, after 1 min Da:
13	Q106	B-E	O													O	Input power was increased by 50W, PF
		C-E	O											O			Pin=29W
		C-B	O											O			Pin=29W
		E		O						O	O			O			F101, D107, D108, Q104, Q113, Q114, Q122,
		B		O						O	O			O		O	Vo up to 29V After 2 min. Da: F101, Q102, Q103
		C		O						O	O			O			F101, Q103, Q113, Q121, Q122

No	Test Position		Test Mode		Test Result													
	Location No	Test Point	Short	Open	1	2	3	4	5	6	7	8	9	10	11	12	Note	
					Fire	Smoke	Burst	Smell	Red Hot	Damaged	Fuse opened	$P < O$	$P < O$	No Output	No Change	Others		
14	Q113	G-S	☐							☐			☐	☐			Q113, Q114	
		D-S	☐							☐			☐	☐			Q113, Q114, Q121, Q122	
		D-G	☐							☐			☐	☐			Q113, Q114	
		S		☐						☐			☐	☐			Q114, Q122	
		G		☐						☐			☐	☐			Q121, Q122	
		D		☐						☐			☐	☐			Q114, Q122	
15	Q115	B-E	☐												☐			
		C-E	☐													☐	Vo up to 25V	
		C-B	☐													☐	Vo up to 25V	
		E		☐												☐		
		B		☐												☐		
		C		☐												☐		
16	Q551, Q552, Q559	G-S	☐													☐	Input power was increased by 20W	
		D-S	☐							☐			☐	☐			Q555, Q556	
		D-G	☐							☐			☐	☐			Q551, Q552, Q555, Q556, D656, R663, A652	
		S		☐												☐	Input power was increased by 5W	
		G		☐												☐	Input power was increased by 5W	
		D		☐												☐	Input power was increased by 5W	
17	Q553, Q554, Q560	G-S	☐													☐	Input power was increased by 20W	
		D-S	☐							☐			☐	☐			Q557, Q558	
		D-G	☐							☐			☐	☐			Q553, Q554, Q557, Q558, D657, R657, A653	
		S		☐												☐	Input power was increased by 5W	
		G		☐												☐	Input power was increased by 5W	
		D		☐												☐	Input power was increased by 5W	
18	Q555, Q556, Q561	G-S	☐													☐	Input power was increased by 20W	
		D-S	☐							☐			☐	☐			Q551, Q552	
		D-G	☐							☐			☐	☐			Q551, Q552, Q555, Q556, D654, R662, A652	
		S		☐												☐	Input power was increased by 5W	
		G		☐												☐	Input power was increased by 5W	
		D		☐												☐	Input power was increased by 5W	
19	Q557, Q558, Q562	G-S	☐													☐	Input power was increased by 5W	
		D-S	☐							☐			☐	☐			Input power was increased by 20W	
		D-G	☐							☐			☐	☐			Q553, Q554	
		S		☐												☐	Q553, Q554, Q557, Q558, D655, R656, A653	
		G		☐												☐	Input power was increased by 5W	
		D		☐												☐	Input power was increased by 5W	
20	Q701~Q705	G-S	☐													☐	Pin up by 30W	
		D-S	☐												☐			
		D-G	☐													☐	Pin up by 30W	
		S		☐												☐	Pin up by 2W	
		G		☐												☐	Pin up by 2W	
		D		☐												☐	Pin up by 2W	

№	Test Position		Test Mode		Test Result													Note
	Location №	Test Point	Short	Open	1	2	3	4	5	6	7	8	9	10	11	12		
					Fire	Smoke	Burst	Smell	Red Hot	Damaged	Fuse opened	⌀ V	⌀ P	No Output	No Change	Others		
21	C144~C159		○	○									○	○				
22	C160~C162		○	○									○	○	○			
23	C551		○	○						○					○	R553~R555		
24	C552		○	○						○					○	R558~R560		
25	C553		○	○						○					○	R563~R565		
26	C554		○	○						○					○	R568~R570		
27	C611~C626		○	○									○	○				
28	C627~C642		○	○						○			○	○	○	Q113, Q114, Q551, Q552, Q555, Q556		
29	C643~C658		○	○						○			○	○	○	Q113, Q114, Q553, Q554, Q557, Q558		
30	T101	1-2	○											○				
		3-5	○						○				○			R151, R172, R173		
		6-7	○												○	Vout up to 29V, after 30s - No output		
		7-8	○											○	○	A107 - Hicc-up		
		9-10	○											○	○	A107 - Hicc-up		
		11-12	○						○					○		Q113, Q121		
		3		○										○				
		1		○										○				
		6		○								○		○				
		8		○										○	○			
		9		○										○				
		11		○												○	Vaux=0	
31	T102	1-2	○											○		Pin=25W		
		3-4	○											○		Pin=25W		
		7-8	○											○		Pin=25W		
		1		○					○				○	○		Q121		
		3		○					○				○	○		Q122		
		7		○					○				○	○		Q121, Q122		
32	T103	1-2	○												○			
		1		○											○			
33	T104	Prim	○						○				○	○		Q113, Q121, Q122		
		Sec	○						○				○	○		Q121		
		Prim		○										○				
		Sec		○										○				

6.VIBRATION TEST

1) Vibration test class

Frequency variable endurance test

2) Equipment used

Controller: Dactron

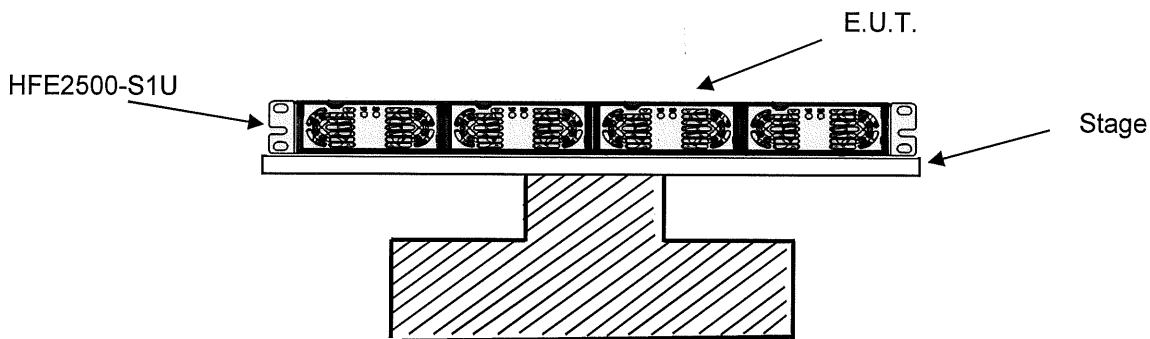
Vibrator: Ling Dynamic Systems

Model:Laser

Model:V875

3) Testing method

HFE2500 installed in HFE2500-S1U



4)Test condition

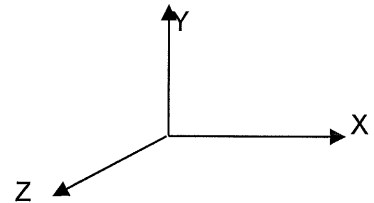
A) Vibration Test with Frequency Sweep

Sinusoidal Vibration in Freq.: 5 - 500 Hz

Test level: 1.5G

Test time: 1 oct/min, 20 sweeps Per axis

Test performed in Axes x-y-z



B) Mech. Shock

Test level: half sine, 36G 11ms

3 mech.shocks in all of the 3 axes at each direction.

5)Test Result: OK

Vibration:

Check item	Vout
Initial Directions	48.027V
X	48.029V
Y	48.020V
Z	48.021V

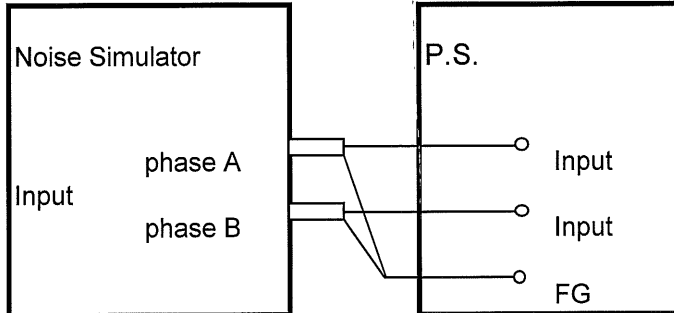
Shock:

Check item	Vout
Initial Directions	48.027V
X	48.029V
Y	48.020V
Z	48.021V

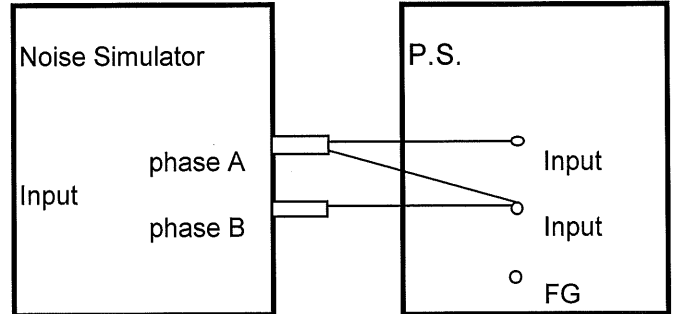
7.NOISE SIMULATION TEST

24V

1) Test circuit and Equipment



Common Mode Noise Test



Normal Mode Noise Test

Impulse noise simulator: INS-4040 (NoiseKen)
Coupling decoupling network: IJ -4050 (NoiseKEN)

2) Acceptance criteria

No damage to P.S.
No output shutdown
No other abnormalities

3)Test condition:

Input voltage:115,230Vac
Output voltage:Rated
Output current:0%,100%
Ambient temperature:25°C
Pulse width:50ns~1000ns

Noise level:0V~2kV
Phase shift:0~360° (step 45°)
Polarity: +,-
Mode:Normal,Common
Line:Trigger select

4)Test Result : **OK**

8.THERMAL SHOCK TEST

24V

1) Test Equipment

Thermal Shock Chamber: TSA-101S-W (TABAI ESPEC CORP.)

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

1 (unit)

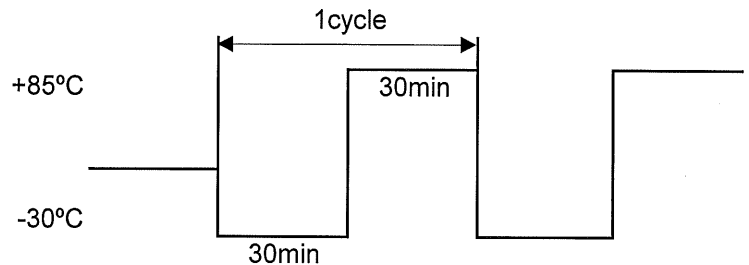
3)Test condition

Ambient temperature: $-30^{\circ}\text{C} \rightleftharpoons +85^{\circ}\text{C}$

Test time: Refer to Dwg.

Test cycle: 200cycles

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. 200cycles later, leave it for 1 hour at the room temperature, then check if there is no abnormal output.

5)Test Result

OK

Vin:230Vac

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
24.008V	23.993V	112mV	23.975V	23.963V	110mV

9.FAN LIFE EXPECTANCY

1) Part name

109P0412K3563 (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 fan exhaust temperature.

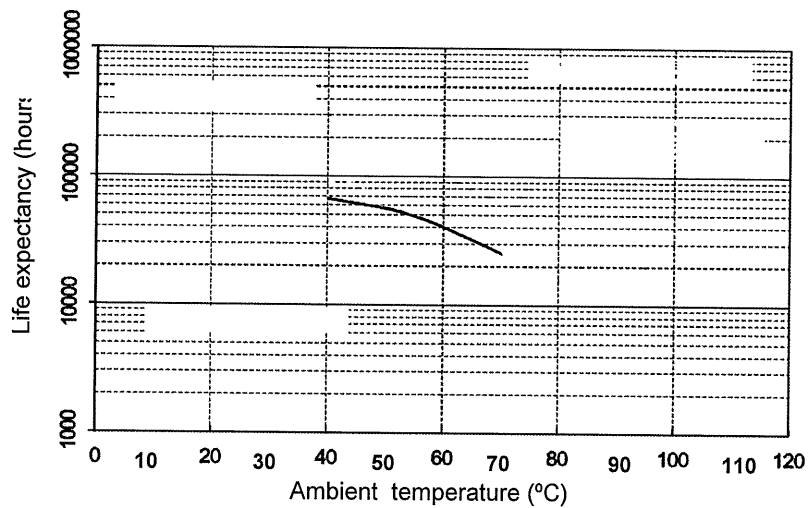


Fig1.

Measuring point of fan exhaust temperature.

