HFE2500
RELIABILITY DATA

DWG: IA689-79-01		
APPD	CHK	DWG
Dorow P. Dec-19-2011	18/12/11	MICHAEC G. 5.12.2011

TDK-Lambda

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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)

M.T.B.F = 219,557 (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.

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

Where:

λ_{equip} = Total Equipment Failure Rate (Failures / 10^6 Hours)
λ_G = Generic Failure Rate For The 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 (π_Q = 1)

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

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

$$\theta j\text{-}c = \frac{Tj(max)-Tc}{Pc(max)} \qquad \theta j\text{-}a = \frac{Tj(max)-Ta}{Pc(max)} \qquad \theta j\text{-}l = \frac{Tj(max)-Tl}{Pc(max)}$$

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

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	ΔTc =	28.8	°C	Tc =	78.8	°C
PANASONIC	Tj = Tc + (θ j-c x Pd) =				89.3	°C	D.F. =	59.5	%
A104	Tjmax=	150	°C	θ_{j-c} =	42.0	°C/W			
MC33063AD	Pd =	0.75	W	ΔTc =	42.9	°C	Tc =	92.9	°C
TI	Tj = Tc + (θ j-c x Pd) =				124.4	°C	D.F. =	82.9	%
A401	Tjmax=	125	°C	θ_{j-a} =	140.0	°C/W			
UCC28061D	Pd =	0.067	W	ΔTa =	14.6	°C	Ta =	64.6	°C
TI	Tj = Ta + (θ j-a x 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	ΔTa =	14.0	°C	Ta =	64.0	°C
FUJI	Tj = Ta + (θ j-a x 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	ΔTa =	24.0	°C	Ta =	74.0	°C
NATIONAL SEMI	Tj = Ta + (θ j-a x Pd) =				94.0	°C	D.F. =	62.7	%
A602	Tjmax=	125	°C	θ_{j-a} =	286.0	°C/W			
TPS2819DBVR	Pd =	0.1	W	ΔTa =	25.4	°C	Ta =	75.4	°C
TI	Tj = Ta + (θ j-a x Pd) =				104.0	°C	D.F. =	83.2	%
A603	Tjmax=	125	°C	θ_{j-a} =	286.0	°C/W			
TPS2819DBVR	Pd =	0.1	W	ΔTa =	24.0	°C	Ta =	74.0	°C
TI	Tj = Ta + (θ j-a x 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	ΔTa =	15.0	°C	Ta =	65.0	°C
NATIONAL SEMI	Tj = Ta + (θ j-a x Pd) =				85.0	°C	D.F. =	56.7	%
A652	Tjmax=	150	°C	θ_{j-a} =	200.0	°C/W			
LM5102MM	Pd =	0.1	W	ΔTa =	16.0	°C	Ta =	66.0	°C
NATIONAL SEMI	Tj = Ta + (θ j-a x Pd) =				86.0	°C	D.F. =	57.3	%
A653	Tjmax=	150	°C	θ_{j-a} =	200.0	°C/W			
LM5102MM	Pd =	0.1	W	ΔTa =	15.0	°C	Ta =	65.0	°C
NATIONAL SEMI	Tj = Ta + (θ j-a x 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	ΔTa =	34.4	°C	Ta =	84.4	°C
LINEAR	Tj = Ta + (θ j-a x Pd) =				90.2	°C	D.F. =	72.2	%
A801	Tjmax=	150	°C	θ_{j-c} =	42.0	°C/W			
MC33063AD	Pd =	0.5	W	ΔTc =	54.8	°C	Tc =	104.8	°C
TI	Tj = Tc + (θ j-c x Pd) =				125.8	°C	D.F. =	83.9	%

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

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

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

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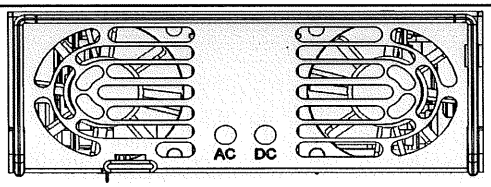
Location №	Vin=230VAC			Load = 100%			Ta=50°C	
Q551	Tjmax=	150	°C	θ_{j-c} =	0.9	°C/W		
BSC077N12NS3	Pd =	1.5	W	ΔTc =	47.4	°C	Tc =	97.4 °C
INFINEON	Tj = Tc + (θ j-c x Pd) =				98.8	°C	D.F. =	65.9 %
Q552	Tjmax=	150	°C	θ_{j-c} =	0.9	°C/W		
BSC077N12NS3	Pd =	1.5	W	ΔTc =	42.1	°C	Tc =	92.1 °C
INFINEON	Tj =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

3.MAIN COMPONENTS TEMPERATURE RISE ΔT LIST

12V

		ΔT Temperature Rise (°C)	
Location No.	Parts Name	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

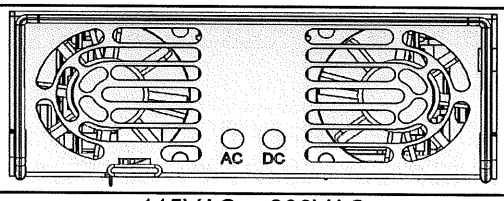
Conditions:

Standard Mounting		
Input Voltage	115VAC	230VAC
Output Voltage	12V	12V
Output Current	125A	200A
Ambient Temperature	50°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

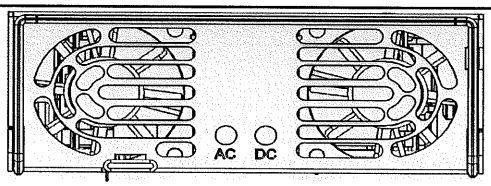
Conditions:

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

48V

		ΔT Temperature Rise (°C)	
Location No.	Parts Name	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

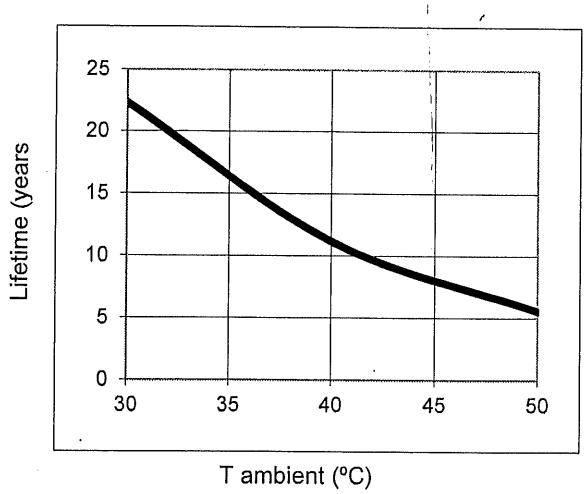
Conditions:

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

4.ELECTROLYTIC CAPACITORS LIFE TIME ESTIMATION

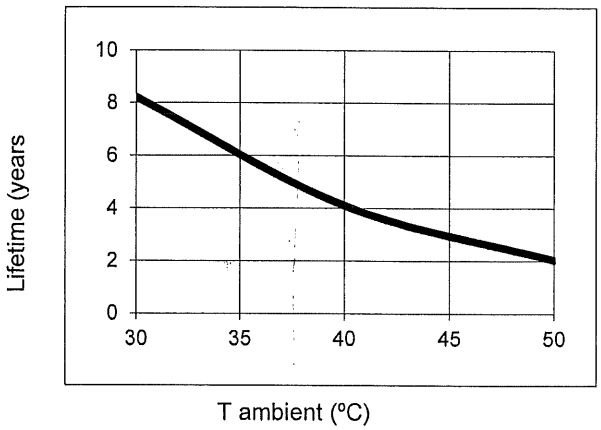
Vin=115Vac

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



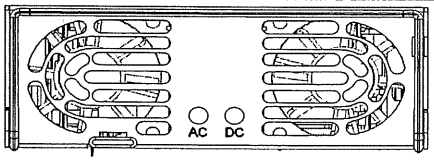
Vin=230Vac

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



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

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

Model:48V
Input:230VAC

Ta:25°C, 70% RH

№	Test Position		Test Mode		Test Result												
					1	2	3	4	5	6	7	8	9	10	11	12	
	Location №	Test Point	Short	Open	Fire	Smoke	Burst	Smell	Red Hot	Damaged	Fuse opened	OVP	OCP	No Output	No Change	Others	Note
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	O			O			F101, Q101, Q102, R109, PFC Control circuit
9	D114		O											O		O	A107 - Hicc-up
				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

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

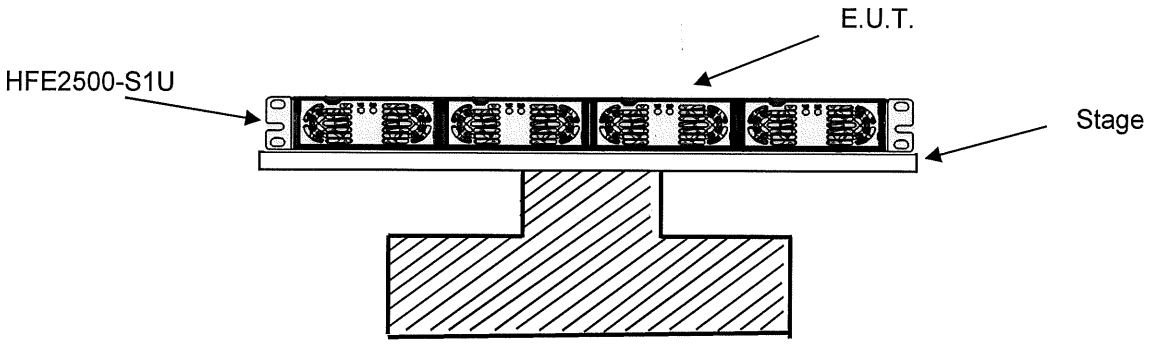
№	Test Position		Test Mode		Test Result												
					1	2	3	4	5	6	7	8	9	10	11	12	
	Location №	Test Point	Short	Open	Fire	Smoke	Burst	Smell	Red Hot	Damaged	Fuse opened	OVP	OCP	No Output	No Change	Others	Note
21	C144~C159		O										O	O			
				O											O		
22	C160~C162		O										O	O			
				O	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

6.VIBRATION TEST

1) Vibration test class
Frequency variable endurance test

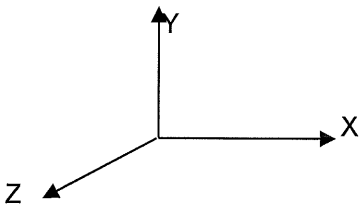
2) Equipment used
Controller: Dactron Model:Laser
Vibrator: Ling Dynamic Systems Model:V875

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

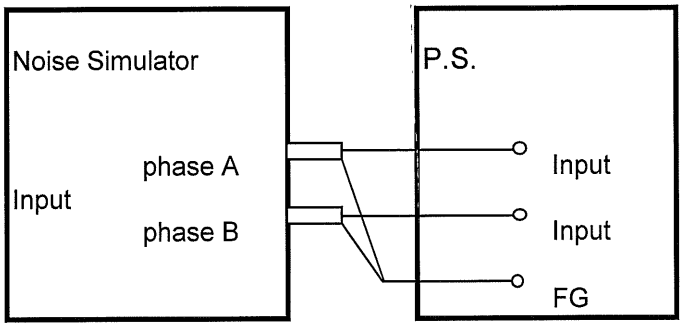
Shock:

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

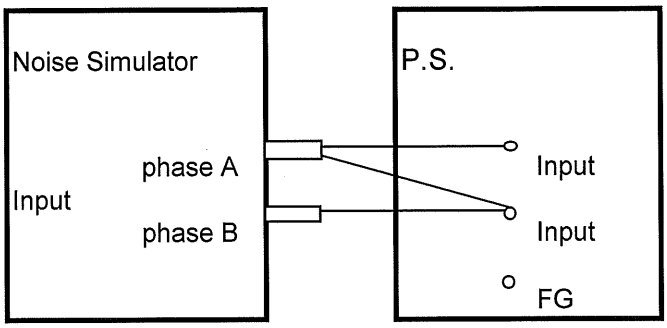
7.NOISE SIMULATION TEST

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

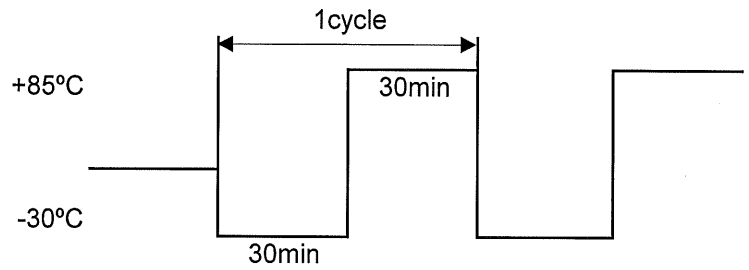
24V

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°C <=> +85°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 1hour 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.

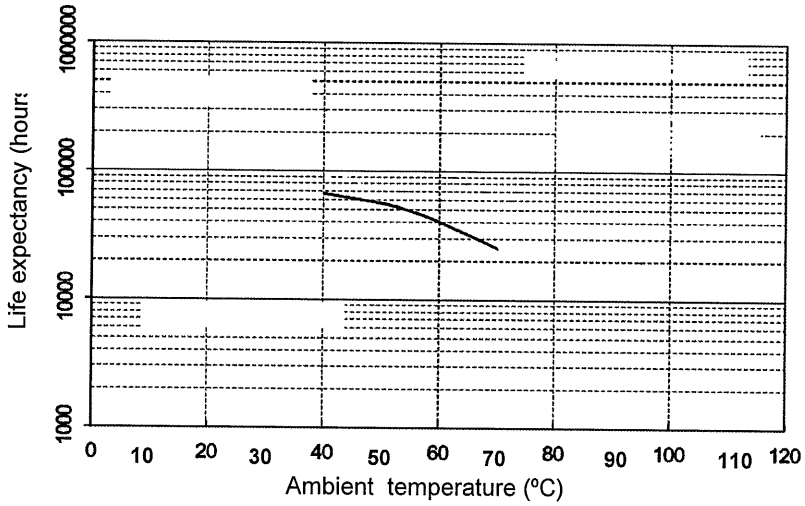


Fig1.
Measuring point of fan exhaust temperature.