

A50 HFE3500

RELIABILITY DATA

Template	260473 iss 3
DWG No.	360253 01

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※Test results are example data based on a unit under our standard measurement condition.

TDK Lambda UK Ltd.
Kingsley Avenue
Ilfracombe
Devon, EX34 8ES
United Kingdom

Website: <https://uk.tdk-lambda.com>

1. Calculated Values for MTTF

MODEL : HFE3500-24/FSD

Calculating Method

Test Specifications: Telcordia SR332 Issue 4, 2016
Test Method: Method I-D (Black Box)
Confidence Level: 90%
Environment: Ground, Fixed, Controlled
Device Method: I-D
Quality Level: II

The failure rates in Failures In Time_ (FITs) is given for the different sub-assemblies at a confidence level of 90% in the table below at 20°C; 30°C; 40°C; 50°C; 60°C; and 70°C.

Telcordia SR332 Issue 4		
Ambient (°C)	FITs (UCL)	MTTF (LCL) / hrs
20	736	1,359,154
30	736	1,359,154
40	1095	913,170
50	1639	609,950
60	2465	405,615
70	3718	268,982

2. Components Derating List**MODEL : HFE3500-24/TSD****Test Conditions**

Vout:	Nominal
Vin:	100Vac
Iout:	100% Load
Ambient:	50°C

ASY103A, ASY103B, ASY102C (Motherboard) Manu Part No. PB5010-BP Manufacturer Micro Commercial Components	Tjmax=150°C	$\theta_{j-c}=0.8^{\circ}\text{C/W}$	
	Pd=20.16W	$\Delta T_c=16.1^{\circ}\text{C}$	Tc=80.5°C
	$T_j = T_c + ((\theta_{j-c}) \times P_d) = 96.6^{\circ}\text{C}$		
	D.F.=64.4%		

ASY102A, ASY102B (Motherboard) Manu Part No. NTHL045N065SC1 Manufacturer On Semi	Tjmax=175°C	$\theta_{j-c}=0.52^{\circ}\text{C/W}$	
	Pd=12.54W	$\Delta T_c=6.5^{\circ}\text{C}$	Tc=113.5°C
	$T_j = T_c + ((\theta_{j-c}) \times P_d) = 120^{\circ}\text{C}$		
	D.F.=68.6%		

XQ301 (Motherboard) Manu Part No. FCD2250N80Z Manufacturer ON Semi	Tjmax=150°C	$\theta_{j-c}=3.2^{\circ}\text{C/W}$	
	Pd=5.63W	$\Delta T_c=18^{\circ}\text{C}$	Tc=97.8°C
	$T_j = T_c + ((\theta_{j-c}) \times P_d) = 115.8^{\circ}\text{C}$		
	D.F.=77.2%		

XQ1 – XQ8 (Primary Power Board) Manu Part No. IPL60R104C7AUMA1 Manufacturer Infineon	Tjmax=150°C	$\theta_{j-c}=1.026^{\circ}\text{C/W}$	
	Pd=4.24W	$\Delta T_c=4.4^{\circ}\text{C}$	Tc=79°C
	$T_j = T_c + ((\theta_{j-c}) \times P_d) = 83.4^{\circ}\text{C}$		
	D.F.=55.6%		

XQ1 – XQ30 (Secondary Power Board) Manu Part No. BSC007N04LS6ATMA1 Manufacturer Infineon	Tjmax=175°C	$\theta_{j-c}=0.8^{\circ}\text{C/W}$	
	Pd=1.83W	$\Delta T_c=1.5^{\circ}\text{C}$	Tc=77.7°C
	$T_j = T_c + ((\theta_{j-c}) \times P_d) = 79.2^{\circ}\text{C}$		
	D.F.=45.2%		

XU601 – XU603 (Motherboard) Manu Part No. TLP2766A(D4,E Manufacturer Toshiba	$T_{jmax}=100^{\circ}\text{C}$ $\theta_{j-c}=416^{\circ}\text{C/W}$ $P_d=0.01\text{W}$ $\Delta T_c=4.2^{\circ}\text{C}$ $T_c=92^{\circ}\text{C}$ $T_j = T_c + ((\theta_{j-c}) \times P_d) = 96.2^{\circ}\text{C}$ $D.F.=96.2\%$
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XU358 (Motherboard) Manu Part No. TLP383(D4GL-TR,E(T Manufacturer Toshiba	$T_{jmax}=100^{\circ}\text{C}$ $\theta_{j-c}=400^{\circ}\text{C/W}$ $P_d=0.01\text{W}$ $\Delta T_c=4^{\circ}\text{C}$ $T_c=85.7^{\circ}\text{C}$ $T_j = T_c + ((\theta_{j-c}) \times P_d) = 89.7^{\circ}\text{C}$ $D.F.=89.7\%$
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XU2 (Motherboard) Manu Part No. FAN3227TMX-F085 Manufacturer ON Semi	$T_{jmax}=150^{\circ}\text{C}$ $\theta_{j-c}=50^{\circ}\text{C/W}$ $P_d=0.07\text{W}$ $\Delta T_c=3.4^{\circ}\text{C}$ $T_c=103.7^{\circ}\text{C}$ $T_j = T_c + ((\theta_{j-c}) \times P_d) = 107.1^{\circ}\text{C}$ $D.F.=71.4\%$
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L101, L102 (Motherboard) Manu Part No. 330026 Manufacturer TDK-Lambda UK	$T_{max}=150^{\circ}\text{C}$ $T_{measured}=112.5^{\circ}\text{C}$ $D.F.=75\%$
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L601, L602 (Motherboard) Manu Part No. 230449 Manufacturer TDK-Lambda UK	$T_{max}=130^{\circ}\text{C}$ $T_{measured}=77.6^{\circ}\text{C}$ $D.F.=59.7\%$
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TX1, TX2 (Motherboard) Manu Part No. 230444 Manufacturer TDK-Lambda UK	$T_{max}=130^{\circ}\text{C}$ $T_{measured}=122.9^{\circ}\text{C}$ $D.F.=94.5\%$
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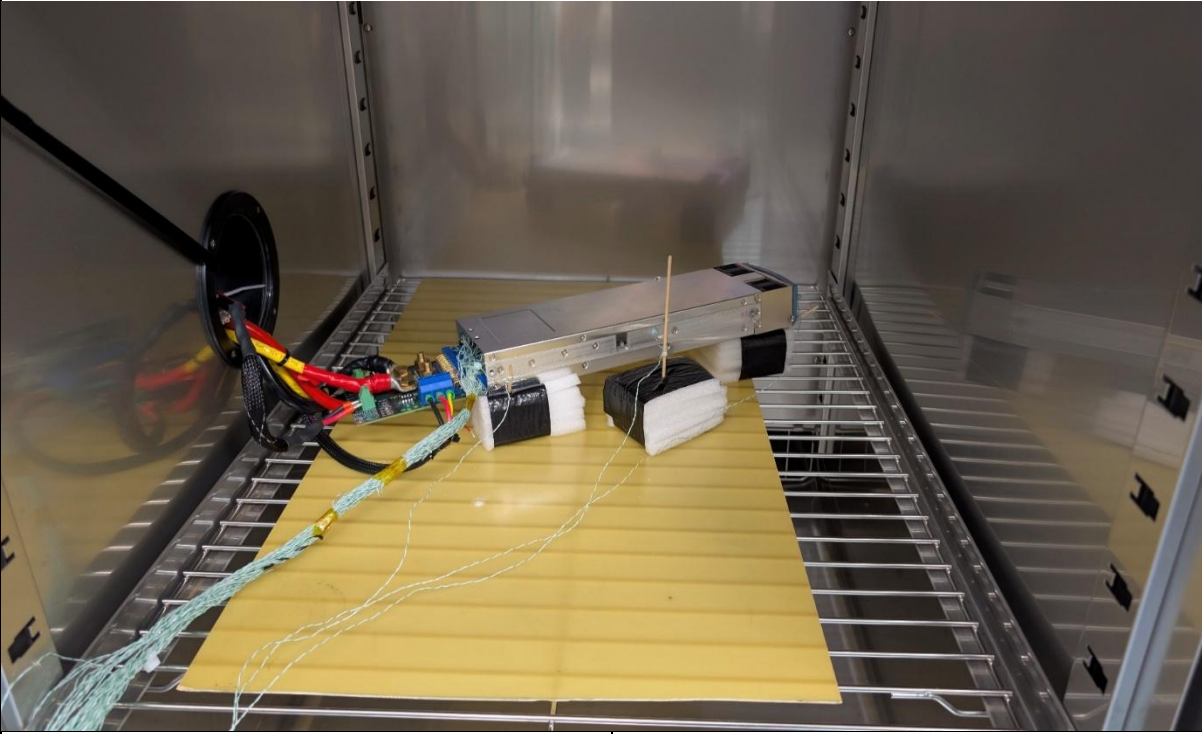
L103, L104 (Motherboard) Manu Part No. 230506 Manufacturer TDK-Lambda UK	$T_{max}=130^{\circ}\text{C}$ $T_{measured}=98.5^{\circ}\text{C}$ $D.F.=75.8\%$
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T301 (Motherboard) Manu Part No. 330003 Manufacturer TDK-Lambda UK	Tmax=130°C Tmeasured=71.3°C D.F.=54.8%
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3. Main components temperature rise ΔT list

MODEL: HFE3500-24/TSD

Measuring conditions

Mounting Method	
	
Input Voltage (VAC)	100
Output Voltage (VDC)	24
Output Current (A)	100% Load

Measuring Results

Output Derating		ΔT Temperature Rise ($^{\circ}\text{C}$)	
		$I_o = 100\%$	$T_a = 50^{\circ}\text{C}$
Location No.	Parts Name	Mounting(A)	
C102	X-Capacitor	34.7	
L101	CM Choke	62.4	
ASY101 C3	Boost Capacitor	7.8	
ASY103 A	Bridge Rectifier	53.9	
L103	Boost Inductor	48.4	
ASY102 A	Boost FET	92.2	
C901	Output Capacitor	22.3	
L602	LLC Dual Choke	17.4	
TX1	LLC Transformer	43.7	
XQ6	LLC Primary FETs	19.6	
XQ28	LLC Secondary FETs	35.4	

4. Electrolytic capacitor lifetime

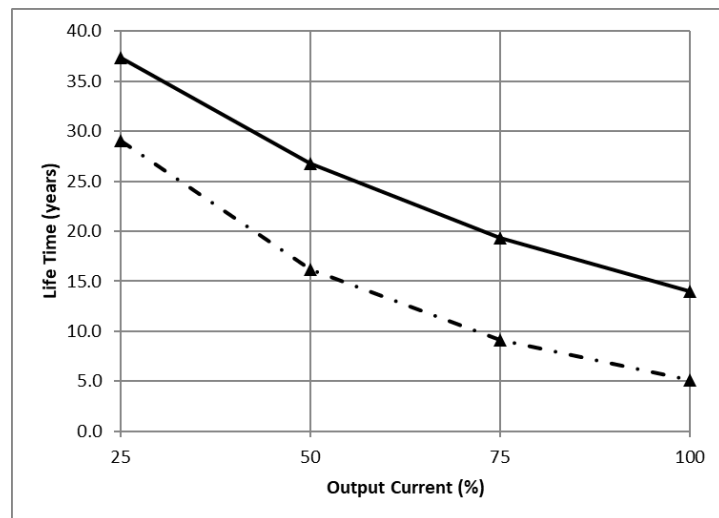
MODEL: HFE3500-24/TSE

Standard Mounting

Conditions Ta 40°C
 Line Low ———
 High - . - . -

V_{in} = 100/220 VAC

Load (%)	Lifetime at 40°C (years)	
	Low Line	High Line
25	37.4	29.0
50	26.8	16.2
75	19.4	9.1
100	14.0	5.1



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

5. Vibration Test

MODEL: HFE3500-24/TSE

(1) Vibration Test Class

Frequency Variable Endurance Test

(2) Equipment Used

Controller: PARC ID 178/179
Vibrator: V830-335 T M8 R-CE with slip table.
Accelerometer: PARC ID 1289 / 1307 / 1388 / 1395

NOTE: The HFE2 was tested at PARC (Product Assessment and Reliability Centre, Bideford UK)

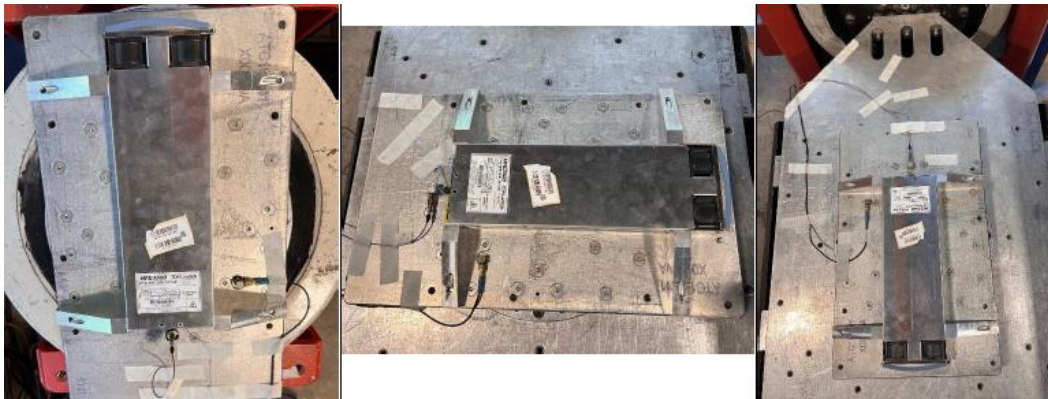
(3) The Number of D.U.T. (Device Under Test)

2 Units

(4) Test Conditions

Sweep Frequency:	10 – 500 Hz	Direction:	X, Y, Z
Sweep Time:	1 octave / minute	Test Time:	60 Minutes
Acceleration:	2.2G	Non-operation	
Mounting:	Customer Fixings		

(5) Test Method



Standard mounting position as per picture above

(6) Acceptable Conditions

1. Not to be broken.
2. No abnormal output after test.

(7) Test Results

No mechanical or electrical damage observed.

6. Thermal shock test

MODEL : HFE3500-48/FSE

(1) Equipment used

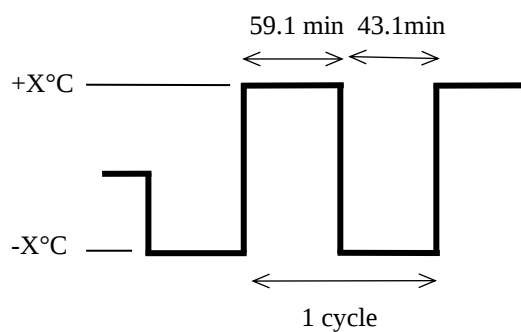
Thermotron Thermal Shock Chamber 6907-2357

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

1 unit

(3) Test Conditions

Ambient Temperature:	-40°C ↔ 85°C
Test Time:	43.1 min ~ 59.1 min
Test Cycle:	500 cycles
Operating Condition:	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.