DC FAN LIFE EXPERIMENT REPORT

DELTA ELECTRONICS, INC.

Available for these models with lower speed and same physical structure. All model may be followed by Rxx or Fxx series suffixes. This test report applies to AFC**70x70x38 mm** series as the right table	AFB0712VHE				

Representative Test P/N : AFC0712DE-5B71

Equipment: 1.Oven: E24-F0058	On/Off Cycles: Every 500 hours

◎ **L$_{10}$ Expectancy:** **70,000** hours minimum @ fan rated voltage and the temperature of 40℃

According to the equation for **Weibull distribution**, **MTTF ≒ 7×L10 =** **490,000** hours

And we rely on a zero failure Weibull test strategy and accelerated testing technique, to determine

the total test time **(t)** for verifying the above life estimation by the equations,

$$t = 1.036 \times MTTF \times [(B_{r;c}) \div n]^{0.91} \div A_F, \text{ and } A_F = 2^{(Ts-Tu)/10}$$

where, $(B_{r;c})$ is Poisson distribution factor with the failure number of r equal to 0 and

the decimal confidence level of c equal to 0.90(90%).

Stress/Elevated Temperature Ts (℃) (Actual Test Temperature)	Unstress Temperature Tu (℃)	Acceleration Factor A$_F$	Quantity of Test Devices n (pcs)	Poisson Distribution Factor B$_{r;c}$	Required test time with zero failure t (hours)	Actual test time with zero failure t (hours)	Verified MTTF 40℃ (hours)	Verified L$_{10}$ 40℃ (hours)
60	**40**	**4.00**	**56**	**2.303**	**6,956**	**6,956.0**	**490,031**	**70,004**

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2005/7/2 5:00 PM	2006/8/21 6:03 PM	☐ In process	☐ In process (exceed requested)	☑ Termination	**6956.0**

Herewith , we could assume as right on the basis of above test result. Besides, if the actual test time exceed the required, it comes out that those fans' L$_{10}$ expectancy and MTTF are greater than the warrant. (**MTTF :** means Mean Time To Failures, it should be used in a non-repairable system setting. Now we show the MTTF in our life report, that's because we will not repair the failed fans during life experiment. **MTBF:** means Mean Time Between failures, it should be used in a repairable system setting. **Basically , MTBF is equal to MTTF , they use same formula to work out a life data.**)

Temperature for MTTF Estimation (℃)	Acceleration Factor A$_F$	Estimated MTTF (hours)	Estimated L$_{10}$ (hours)
25	**11.31**	**1,386,017**	**198,002**
30	**8.00**	**980,062**	**140,009**
40	**4.00**	**490,031**	**70,004**
50	**2.00**	**245,015**	**35,002**
60	**1.00**	**122,508**	**17,501**

Fan permission criteria for the measurement after test :
1. For current, the limit is less than spec.(max.).
2. For speed, the allowable decrease is less than 15%.
3. For noise, the limit is less than spec.(max.). + 3 dB

Test Result	☑ **Accept**
	☐ **Reject**

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG05FNL148	**3005.50**	**2006/8/21 6:30 PM**	**Nan.Yang**	**Gx.Xu**

DC FAN FUNCTION TEST RECORD
FOR LIFE EXPERIMENT

DELTA ELECTRONICS, INC.

	AFB0712VHE			
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Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
6,956	2005/7/2 5:00 PM	2006/8/21 6:03 PM	56	0	6956.0

Representative Test P/N : AFC0712DE-5B71	Current Test Status	☐ In process	☐ In process (exceed requested)	☑ Termination

Equipment: 1.Oven: E24-F0058	On/Off Cycles: Every 500 hours

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) 0.92Max.	Final Test Current Spec. (A) 0.92Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 6300-7700	Final Test Speed Spec. (RPM) 6300-7700	Deviation (%)	Initial Test Noise Spec. (dB A) 55.0Max	Final Test Noise Spec. (dB A) 55.0Max	Deviation (%)
1	0.61	0.60	-1.8	7114	7126	0.2	50.9	51.1	0.4
2	0.60	0.60	-0.7	7115	7162	0.7	50.6	50.8	0.4
3	0.62	0.61	-1.1	7143	7202	0.8	51.1	51.3	0.4
4	0.61	0.60	-2.1	7180	7158	-0.3	50.8	50.9	0.2
5	0.60	0.60	0.7	7128	7135	0.1	50.7	51.1	0.8
6	0.63	0.62	-0.8	7234	7165	-1.0	50.6	50.8	0.4
7	0.60	0.61	1.8	7193	7195	0.0	50.9	51.1	0.4
8	0.60	0.60	-0.3	7134	7184	0.7	51.3	51.4	0.2
9	0.60	0.61	2.0	7151	7213	0.9	51.0	51.2	0.4
10	0.65	0.64	-1.5	7285	7148	-1.9	50.6	50.8	0.4
11	0.61	0.60	-0.8	7151	7168	0.2	51.5	51.6	0.2
12	0.59	0.60	1.7	7109	7192	1.2	50.9	51.1	0.4
13	0.58	0.59	1.4	7059	7126	0.9	50.7	51.0	0.6
14	0.59	0.60	2.2	7041	7056	0.2	51.3	51.4	0.2
15	0.63	0.62	-1.7	7284	7159	-1.7	50.9	51.0	0.2
16	0.60	0.60	0.3	7188	7202	0.2	50.7	51.0	0.6
17	0.63	0.62	-0.8	7223	7214	-0.1	50.8	51.1	0.6
18	0.60	0.61	2.2	7101	7136	0.5	50.6	50.8	0.4
19	0.62	0.61	-1.6	7254	7205	-0.7	50.3	50.4	0.2
20	0.60	0.60	-0.3	7280	7265	-0.2	50.9	51.1	0.4
21	0.60	0.60	0.8	7135	7295	2.2	50.7	50.9	0.4
22	0.59	0.60	1.4	7121	7268	2.1	50.5	50.6	0.1
23	0.56	0.58	3.9	7025	7026	0.0	51.0	51.3	0.6
24	0.56	0.58	3.0	7084	7130	0.6	51.9	51.7	-0.4
25	0.59	0.60	1.7	7036	7058	0.3	50.4	50.6	0.4
26	0.59	0.60	2.4	7062	7064	0.0	50.1	50.4	0.6
27	0.59	0.61	2.9	7035	7138	1.5	51.0	51.2	0.4
28	0.57	0.59	3.9	7055	7100	0.6	50.6	51.0	0.8
29	0.59	0.60	1.7	7099	7135	0.5	50.6	51.1	1.0
30	0.58	0.58	-0.7	7108	7126	0.3	51.0	51.3	0.6
31	0.62	0.61	-1.6	7126	7164	0.5	50.6	50.9	0.6
32	0.58	0.60	3.3	7173	7124	-0.7	50.8	51.1	0.6
33	0.59	0.60	1.0	7121	7169	0.7	50.5	50.6	0.2
34	0.62	0.61	-1.3	7157	7138	-0.3	50.9	51.1	0.4
35	0.56	0.58	2.8	7016	7065	0.7	50.7	51.0	0.6

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG05FNL148	3005.50	2006/8/21 6:30 PM	Nan.Yang	Gx.Xu

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36	0.57	0.58	2.1	7071	7062	-0.1	50.7	51.0	0.6
37	0.60	0.60	-0.2	7077	7152	1.1	50.8	51.1	0.6
38	0.60	0.61	1.3	7078	7105	0.4	50.0	50.5	1.0
39	0.61	0.60	-1.0	7185	7168	-0.2	50.7	51.0	0.6
40	0.61	0.61	0.5	7186	7125	-0.8	50.9	51.2	0.6
41	0.58	0.60	3.1	7042	7136	1.3	50.8	51.1	0.6
42	0.62	0.61	-2.1	7176	7195	0.3	50.3	50.6	0.6
43	0.58	0.60	3.8	7062	7105	0.6	50.6	51.1	1.0
44	0.58	0.60	3.6	7032	7095	0.9	50.5	50.6	0.2
45	0.58	0.60	3.4	7065	7102	0.5	50.6	51.0	0.8
46	0.58	0.59	1.5	7026	7064	0.5	50.7	51.0	0.6
47	0.60	0.60	-0.3	7178	7154	-0.3	50.7	51.2	1.0
48	0.60	0.60	0.5	7158	7168	0.1	51.3	51.5	0.4
49	0.59	0.60	1.4	7162	7135	-0.4	51.0	51.3	0.6
50	0.59	0.59	0.7	7142	7162	0.3	50.6	51.0	0.8
51	0.56	0.58	3.0	6973	7065	1.3	50.9	51.2	0.6
52	0.60	0.61	2.2	7179	7195	0.2	50.3	50.6	0.6
53	0.60	0.61	1.0	7230	7185	-0.6	50.7	51.1	0.7
54	0.60	0.60	0.0	7076	7105	0.4	51.3	51.5	0.4
55	0.60	0.60	-0.2	7143	7135	-0.1	50.9	51.3	0.8
56	0.62	0.61	-1.3	7184	7102	-1.1	50.4	50.6	0.4
X-Bar	0.597	0.601	-	7127.6	7145.1	-	50.77	51.02	-
σ	0.018	0.011	-	72.670	55.044	-	0.330	0.292	-

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DG05FNL148	**3005.50**	**2006/8/21 6:30 PM**	**Nan.Yang**	**Gx.Xu**