DELTA ELECTRONICS, INC.

DC FAN LIFE EXPERIMENT REPORT

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 **FFC80x80x38mm** series as the right table					
Representative Test P/N :FFC0812DE-F00					
Equipment: 1.Oven:			On/Off Cycles: Every 500 hours		

◎ **L_{10} Expectancy: 50,000 hours minimum @ fan rated voltage and the temperature of 40℃**

According to the equation for **Weibull distribution**, **MTTF 7×L10 = 350,000 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)
70	40	8.00	56	2.303	2,484	2,484.0	349,982	49,997

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2004/4/27 5:00 AM	2004/10/15 5:07 PM	☐ In process	☐ In process (exceed requested)	☑ Termination	2484.0

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	22.63	989,898	141,414
30	16.00	699,964	99,995
40	8.00	349,982	49,997
50	4.00	174,991	24,999
60	2.00	87,495	12,499
70	1.00	43,748	6,250

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 Restult	☑ Accept ☐ Reject

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG04FNL086	1632.00	2004/10/15 5:00 PM	Huiling.Fu	Even.Liu

Note: The test sample equivalent to STD, Part number: FFC0812DE-F00.

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DC FAN FUNCTION TEST RECORD
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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)
2,484	2004/4/27 5:00 AM	2004/10/15 5:07 PM	56	0	**2484.0**

Representative Test P/N :FFC0812DE-F00	**Current Test Status**	☐ In process	☐ In process (exceed requested)	☑ Termination
Equipment: 1.Oven:		On/Off Cycles: Every 500 hours		

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) **1.80Max.**	Final Test Current Spec. (A) **1.80Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **6900-8100**	Final Test Speed Spec. (RPM) **6900-8100**	Deviation (%)	Initial Test Noise Spec. (dB A) **66.2Max**	Final Test Noise Spec. (dB A) **66.2Max**	Deviation (%)
1	1.54	1.56	1.3	7515	7418	-1.3	62.1	62.3	0.3
2	1.54	1.62	5.2	7708	7529	-2.3	61.4	62.0	1.0
3	1.47	1.56	6.1	7468	7398	-0.9	61.8	62.4	1.0
4	1.55	1.56	0.6	7519	7421	-1.3	62.3	62.5	0.3
5	1.52	1.55	2.0	7477	7435	-0.6	61.3	62.7	2.3
6	1.55	1.56	0.6	7467	7444	-0.3	62.3	62.5	0.3
7	1.55	1.57	1.3	7539	7521	-0.2	61.7	62.1	0.6
8	1.52	1.55	2.0	7521	7517	-0.1	61.5	62.0	0.8
9	1.63	1.65	1.2	7273	7537	3.6	62.1	62.5	0.6
10	1.53	1.53	0.0	7429	7279	-2.0	61.4	62.3	1.5
11	1.52	1.54	1.3	7379	7611	3.1	60.1	62.5	4.0
12	1.53	1.57	2.6	7385	7409	0.3	62.1	62.2	0.2
13	1.52	1.55	2.0	7491	7438	-0.7	62.0	62.1	0.2
14	1.56	1.62	3.8	7522	7543	0.3	62.3	62.0	-0.5
15	1.65	1.70	3.0	7885	7811	-0.9	62.1	63.0	1.4
16	1.52	1.59	4.6	7539	7490	-0.6	61.4	62.8	2.3
17	1.49	1.50	0.7	7572	7338	-3.1	62.2	62.2	0.0
18	1.54	1.55	0.6	7529	7410	-1.6	62.4	61.8	-1.0
19	1.56	1.59	1.9	7562	7541	-0.3	62.3	62.0	-0.5
20	1.48	1.57	6.1	7548	7448	-1.3	62.0	62.2	0.3
21	1.57	1.57	0.0	7598	7436	-2.1	62.7	62.7	0.0
22	1.58	1.62	2.5	7656	7475	-2.4	62.2	62.5	0.5
23	1.59	1.63	2.5	7553	7540	-0.2	62.2	62.3	0.2
24	1.59	1.60	0.6	7580	7495	-1.1	61.6	62.4	1.3
25	1.54	1.57	1.9	7521	7499	-0.3	62.0	62.3	0.5
26	1.54	1.60	3.9	7238	7565	4.5	62.5	63.0	0.8
27	1.42	1.63	14.8	7634	7548	-1.1	62.3	62.4	0.2
28	1.42	1.50	5.6	7408	7402	-0.1	62.0	62.3	0.5
29	1.52	1.57	3.3	7420	7446	0.4	62.2	62.8	1.0
30	1.51	1.57	4.0	7469	7422	-0.6	62.2	62.3	0.2
31	1.55	1.57	1.3	7525	7401	-1.6	62.1	62.4	0.5
32	1.53	1.56	2.0	7515	7448	-0.9	60.1	62.5	4.0
33	1.57	1.60	1.9	7491	7455	-0.5	62.6	62.7	0.2
34	1.54	1.60	3.9	7442	7459	0.2	62.3	62.4	0.2
35	1.52	1.57	3.3	7443	7431	-0.2	62.0	63.1	1.8

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG04FNL086	**1632.00**	**2004/10/15 5:00 PM**	**Huiling.Fu**	**Even.Liu**

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DC FAN FUNCTION TEST RECORD
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2,484	2004/4/27 5:00 AM	2004/10/15 5:07 PM	56	0	**2484.0**

Representative Test P/N :FFC0812DE-F00	**Current Test Status**	☐ In process	☐ In process (exceed requested)	☑ Termination
Equipment: 1.Oven:		On/Off Cycles: Every 500 hours		

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) **1.80Max.**	Final Test Current Spec. (A) **1.80Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **6900-8100**	Final Test Speed Spec. (RPM) **6900-8100**	Deviation (%)	Initial Test Noise Spec. (dB A) **66.2Max**	Final Test Noise Spec. (dB A) **66.2Max**	Deviation (%)
36	1.47	1.48	0.7	7412	7446	0.5	61.4	63.2	2.9
37	1.69	1.68	-0.6	7683	7553	-1.7	61.6	63.0	2.3
38	1.70	1.74	2.4	7720	7747	0.3	62.0	62.8	1.3
39	1.53	1.57	2.6	7507	7555	0.6	61.3	62.6	2.1
40	1.48	1.50	1.4	7332	7227	-1.4	61.3	62.4	1.8
41	1.60	1.58	-1.3	7551	7482	-0.9	62.3	62.9	1.0
42	1.55	1.58	1.9	7520	7409	-1.5	62.1	62.4	0.5
43	1.59	1.61	1.3	7614	7590	-0.3	62.7	62.2	-0.8
44	1.50	1.53	2.0	7417	7439	0.3	62.4	63.0	1.0
45	1.65	1.70	3.0	7569	7513	-0.7	62.0	63.2	1.9
46	1.60	1.67	4.4	7601	7618	0.2	61.9	63.0	1.8
47	1.54	1.58	2.6	7596	7445	-2.0	62.3	62.7	0.6
48	1.51	1.52	0.7	7384	7426	0.6	61.6	62.4	1.3
49	1.56	1.60	2.6	7491	7440	-0.7	62.7	62.2	-0.8
50	1.52	1.56	2.6	7399	7444	0.6	62.5	62.5	0.0
51	1.65	1.64	-0.6	7540	7478	-0.8	61.4	62.3	1.5
52	1.56	1.61	3.2	7553	7518	-0.5	61.5	62.4	1.5
53	1.55	1.60	3.2	7414	7382	-0.4	62.3	62.5	0.3
54	1.49	1.54	3.4	7495	7471	-0.3	62.4	62.4	0.0
55	1.49	1.54	3.4	7498	7383	-1.5	61.4	62.0	1.0
56	1.55	1.58	1.9	7533	7501	-0.4	62.5	62.2	-0.5
X-Bar	1.545	1.583	-	7516.6	7473.9	-	61.95	62.47	-
σ	0.056	0.051	-	102.451	94.113	-	0.539	0.334	-

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