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 **FFB38x38x28 mm** series as the right table	FFB03812HHN				
	FFB03812HN				
	FFB03812LN				
	FFB03812MN				
Representative Test P/N :FFB03812VHN-F00					
Equipment:1.Oven: E24-F0054			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/ElevatedTemperature 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	4,968	4,969.0	350,052	50,007

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2004/10/16 8:30 PM	2005/7/9 4:45 PM	☐ In process	☐ In process (exceed requested)	☑ Termination	**4969.0**

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.)

Temperature for MTTF Estimation (℃)	Acceleration Factor A_F	Estimated MTTF (hours)	Estimated L_{10} (hours)
25	11.31	990,097	141,442
30	8.00	700,104	100,015
40	4.00	350,052	50,007
50	2.00	175,026	25,004
60	1.00	87,513	12,502

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
DG04FNL294	1412.00	2005/7/9 5:30 PM	Guie.Lin	Gx.Xu

DELTA ELECTRONICS, INC.

DC FAN FUNCTION TEST RECORD
FOR LIFE EXPERIMENT

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FFB03812HHN				
FFB03812HN				
FFB03812LN				
FFB03812MN				

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
4,968	2004/10/16 8:30 PM	2005/7/9 4:45 PM	56	0	**4969.0**

Representative Test P/N :FFB03812VHN-F00	Current Test Status	☐ In process	☐ In process (exceed requested)	☑ Termination

Equipment:1.Oven: E24-F0054 — On/Off Cycles: Every 500 hours

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) **0.78Max.**	Final Test Current Spec. (A) **0.78Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **14720-17280**	Final Test Speed Spec. (RPM) **14720-17280**	Deviation (%)	Initial Test Noise Spec. (dB A) **62.5Max**	Final Test Noise Spec. (dB A) **62.5Max**	Deviation (%)
1	0.50	0.50	0.0	15660	16103	2.8	59.0	59.7	1.2
2	0.57	0.56	-1.8	16285	16373	0.5	60.0	59.1	-1.5
3	0.54	0.53	-1.9	16240	16203	-0.2	59.3	59.3	0.0
4	0.55	0.54	-1.8	16293	16320	0.2	59.4	59.7	0.5
5	0.59	0.63	6.8	15283	16656	9.0	59.8	59.0	-1.3
6	0.56	0.55	-1.8	16581	16332	-1.5	60.1	59.5	-1.0
7	0.58	0.57	-1.7	16375	16486	0.7	59.6	60.1	0.8
8	0.58	0.51	-12.1	16160	16048	-0.7	59.3	60.7	2.4
9	0.53	0.53	0.0	16081	16245	1.0	60.0	59.0	-1.7
10	0.55	0.54	-1.8	16216	16262	0.3	60.3	59.6	-1.2
11	0.54	0.54	0.0	16287	16388	0.6	59.8	58.9	-1.5
12	0.54	0.54	0.0	16291	16350	0.4	59.6	59.9	0.5
13	0.57	0.56	-1.8	16225	16531	1.9	60.3	59.3	-1.7
14	0.52	0.56	7.7	16652	16637	-0.1	60.0	59.7	-0.5
15	0.65	0.64	-1.5	16357	16845	3.0	59.4	60.3	1.5
16	0.52	0.54	3.8	16384	16360	-0.1	59.4	59.0	-0.7
17	0.54	0.54	0.0	16422	16385	-0.2	59.6	59.6	0.0
18	0.58	0.50	-13.8	15998	16067	0.4	59.8	60.2	0.7
19	0.59	0.59	0.0	16466	16603	0.8	60.2	59.8	-0.7
20	0.54	0.54	0.0	16122	16305	1.1	60.0	59.2	-1.3
21	0.48	0.47	-2.1	15543	15685	0.9	59.6	59.0	-1.0
22	0.57	0.58	1.8	16607	16627	0.1	59.3	60.3	1.7
23	0.53	0.61	15.1	16594	16848	1.5	59.0	59.7	1.2
24	0.54	0.53	-1.9	16363	16284	-0.5	59.6	59.3	-0.5
25	0.53	0.58	9.4	16442	16316	-0.8	59.8	59.1	-1.2
26	0.52	0.53	1.9	16191	16240	0.3	60.3	59.5	-1.3
27	0.56	0.56	0.0	16486	16037	-2.7	60.0	60.3	0.5
28	0.53	0.52	-1.9	16246	16247	0.0	59.3	59.7	0.7
29	0.51	0.52	2.0	16028	16099	0.4	59.7	59.2	-0.8
30	0.54	0.55	1.9	16004	16280	1.7	59.7	59.7	0.0
31	0.51	0.57	11.8	15440	16526	7.0	60.3	59.5	-1.3
32	0.54	0.56	3.7	16481	16554	0.4	59.4	59.3	-0.2
33	0.50	0.53	6.0	15753	16226	3.0	60.0	60.3	0.5
34	0.56	0.57	1.8	16162	16473	1.9	59.8	59.1	-1.2
35	0.52	0.50	-3.8	15149	16004	5.6	60.1	58.9	-2.0

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG04FNL294	**1412.00**	**2005/7/9 5:30 PM**	**Guie.Lin**	**Gx.Xu**

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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)
4,968	2004/10/16 8:30 PM	2005/7/9 4:45 PM	56	0	**4969.0**

Representative Test P/N :FFB03812VHN-F00	Current Test Status	☐ In process	☐ In process (exceed requested)	☑ Termination
Equipment:1.Oven: E24-F0054		On/Off Cycles: Every 500 hours		

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) **0.78Max.**	Final Test Current Spec. (A) **0.78Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **14720-17280**	Final Test Speed Spec. (RPM) **14720-17280**	Deviation (%)	Initial Test Noise Spec. (dB A) **62.5Max**	Final Test Noise Spec. (dB A) **62.5Max**	Deviation (%)
36	0.53	0.53	0.0	16815	16213	-3.6	60.3	59.8	-0.8
37	0.51	0.51	0.0	15964	16146	1.1	60.0	59.6	-0.7
38	0.53	0.53	0.0	16316	16219	-0.6	59.6	60.5	1.5
39	0.54	0.54	0.0	15776	16262	3.1	59.4	59.7	0.5
40	0.56	0.55	-1.8	16287	16376	0.5	59.3	59.6	0.5
41	0.50	0.53	6.0	15444	16172	4.7	59.8	59.6	-0.3
42	0.58	0.57	-1.7	16816	16782	-0.2	60.0	59.3	-1.2
43	0.54	0.55	1.9	15935	16368	2.7	59.7	59.2	-0.8
44	0.55	0.56	1.8	15915	16492	3.6	60.2	60.1	-0.2
45	0.51	0.53	3.9	15521	16011	3.2	60.3	59.8	-0.8
46	0.54	0.54	0.0	16300	16780	2.9	60.0	59.2	-1.3
47	0.53	0.61	15.1	16360	16615	1.6	60.3	59.1	-2.0
48	0.50	0.57	14.0	16160	16205	0.3	59.7	59.7	0.0
49	0.57	0.55	-3.5	16205	16312	0.7	59.2	59.0	-0.3
50	0.53	0.52	-1.9	16639	16114	-3.2	59.8	60.3	0.8
51	0.62	0.57	-8.1	16509	16511	0.0	59.6	59.6	0.0
52	0.56	0.56	0.0	16162	16198	0.2	60.0	59.3	-1.2
53	0.55	0.55	0.0	16036	16403	2.3	60.2	59.2	-1.7
54	0.57	0.57	0.0	16450	16724	1.7	59.3	61.0	2.9
55	0.56	0.58	3.6	16117	16662	3.4	60.3	59.1	-2.0
56	0.59	0.58	-1.7	16489	16377	-0.7	60.0	59.7	-0.5
X-Bar	0.546	0.550	-	16180.1	16355.1	-	59.78	59.59	-
σ	0.031	0.032	-	367.365	235.899	-	0.365	0.486	-

QE File No.	Time-out for function test or others (hrs)	Issued Date	Reported By	Approved By
DG04FNL294	**1412.00**	**2005/7/9 5:30 PM**	**Guie.Lin**	**Gx.Xu**