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 **AFB 50x50x15 mm** series as the right table	AFB0512HHB	AFB0512HB	AFB0512MB	AFB0512LB	AFB0505HHB
	AFB0505HB	AFB0505MB	AFB0505LB	AFB0524HHB	AFB0524HB
	AFB0524MB	AFB0524LB			

Representative Test P/N : AFB0512HHB-F00

Instruments used: 1.Oven: F00-5, E24-T060 2. DC Source: GW GPC-3060D | 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%), and

Stress/Elevated Temperature Ts (℃)	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 (hours)	Verified L_{10} (hours)
70	40	8.00	30	2.303	6,137	8,360.0	667,464	95,352

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2003/2/5 11:20 AM	2003/12/20 11:46 PM	☐ In process	☐ In process (exceed requested)	☑ Termination	8360.0

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.**)

Fan permission criteria for the measurement after test :

1. For current, the limit is less than spec.(max.).
2. For speed, the allowable descrease is less than 15%.
3. For noise, the limit is less than spec.(max.). + 3 dB

Temperature for MTTF Estimation (℃)	Acceleration Factor A_F	Estimated MTTF (hours)	Estimated L_{10} (hours)
25	22.63	1,887,872	269,696
30	16.00	1,334,927	190,704
40	8.00	667,464	95,352
50	4.00	333,732	47,676
60	2.00	166,866	23,838
70	1.00	83,433	11,919

Test Restult ☑ Accept ☐ Reject

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
TH03FNL003	1507.20	2004/3/22 2:30 PM	Karaket	Jakkrit. P

DELTA ELECTRONICS, INC.

DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

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AFB0512HHB	AFB0512HB	AFB0512MB	AFB0512LB	AFB0505HHB
AFB0505HB	AFB0505MB	AFB0505LB	AFB0524HHB	AFB0524HB
AFB0524MB	AFB0524LB			

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
6,137	2003/2/5 11:20 AM	2003/12/20 11:46 PM	30	0	**8360.0**

epresentative Test P/N : **AFB0512HHB-F00**

Current Test Status ☐ In process ☐ In process (exceed requested) ☑ Termination

Instruments used: 1.Oven: F00-5, E24-T060 2. DC Source: GW GPC-3060D

On/Off Cycles: Every 500 hours

Test Data Between Initial Test and Final Test

Sample P/N : 3620500211

Sample No.	Initial Test Current Spec. (A) **0.20 Max.**	Final Test Current Spec. (A) **0.20 Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **6400 Ref.**	Final Test Speed Spec. (RPM) **6400-15%**	Deviation (%)	Initial Test Noise Spec. (dB A) **39.0 Max.**	Final Test Noise Spec. (dB A) **42.0 Max.**	Deviation (%)
1	0.12	0.12	0.0	7253	7147	-1.5	39.6	39.6	-0.1
2	0.12	0.12	0.0	7204	7040	-2.3	39.0	38.7	-0.9
3	0.12	0.12	0.0	7258	7157	-1.4	39.8	39.9	0.2
4	0.12	0.12	0.0	7260	7125	-1.9	39.8	39.9	0.3
5	0.12	0.12	0.0	7280	7122	-2.2	39.7	39.4	-0.8
6	0.12	0.12	0.0	7263	7188	-1.0	39.4	39.7	0.8
7	0.13	0.12	-7.7	7280	7224	-0.8	40.2	39.2	-2.5
8	0.12	0.12	0.0	7140	7142	0.0	39.2	38.1	-2.9
9	0.12	0.12	0.0	7269	7206	-0.9	39.9	38.7	-3.1
10	0.12	0.12	0.0	7244	7164	-1.1	39.8	38.9	-2.3
11	0.12	0.12	0.0	7191	7124	-0.9	39.0	38.3	-1.7
12	0.12	0.12	0.0	7285	7226	-0.8	39.7	38.6	-2.9
13	0.12	0.12	0.0	7195	7163	-0.4	39.2	38.1	-2.7
14	0.12	0.12	0.0	7105	7055	-0.7	38.8	38.1	-1.9
15	0.12	0.12	0.0	7202	7112	-1.2	39.5	39.0	-1.4
16	0.13	0.12	-7.7	7289	7183	-1.5	39.8	38.6	-3.0
17	0.12	0.12	0.0	7090	7072	-0.3	39.5	38.8	-1.7
18	0.12	0.12	0.0	7247	7205	-0.6	39.5	38.3	-3.0
19	0.12	0.12	0.0	7249	7188	-0.8	40.2	38.5	-4.2
20	0.12	0.12	0.0	7213	7162	-0.7	39.0	38.2	-2.2
21	0.12	0.12	0.0	7238	7170	-0.9	40.0	39.6	-1.1
22	0.12	0.12	0.0	7279	7185	-1.3	40.1	39.0	-2.8
23	0.12	0.12	0.0	7077	7025	-0.7	38.4	38.4	0.0
24	0.12	0.12	0.0	7251	7140	-1.5	40.0	39.4	-1.6
25	0.12	0.12	0.0	7204	7146	-0.8	39.0	38.5	-1.3
26	0.12	0.12	0.0	7157	7159	0.0	39.2	38.5	-1.9
27	0.12	0.12	0.0	7207	7162	-0.6	39.1	38.8	-0.7
28	0.12	0.12	0.0	7147	7133	-0.2	39.1	38.6	-1.4
29	0.12	0.12	0.0	7150	7080	-1.0	39.1	38.8	-0.9
30	0.12	0.12	0.0	7087	7073	-0.2	38.7	38.0	-1.8
X-Bar	0.121	0.120	-	7210.467	7142.600	-	39.443	38.792	-
σ	0.003	0.000	-	64.363	52.465	-	0.472	0.557	-

QE File No.	Time-out for function test or others (hrs)	Issued Date	Reported By	Approved By
TH03FNL003	**1507.20**	**2004/3/22 2:30 PM**	Karaket	Jakkrit. P