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 **EFB80x80x15 mm** series as the right table	EFB0812HHB	EFB0824HHB	EFB0812HB-7K78		
	EFB0812HB	EFB0824HB			
	EFB0812MB	EFB0824MB			
	EFB0812LB	EFB0824LB			
Representative Test P/N :EFB0812HHB-F00					
Equipment: 1.Oven: E24-F0030			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)
70	40	8.00	56	2.303	3,478	3,478.0	490,031	70,004

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2004/4/25 6:00 PM	2004/10/27 11:16 PM	☐ In process	☐ In process (exceed requested)	☑ Termination	3478.0

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	22.63	1,386,017	198,002
30	16.00	980,062	140,009
40	8.00	490,031	70,004
50	4.00	245,015	35,002
60	2.00	122,508	17,501
70	1.00	61,254	8,751

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

Test Restult ☑ Accept ☐ Reject

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG04FNL115	~~967.50~~	~~2004/10/27 11:30 PM~~	~~Huiling.Fu~~	~~Even.Liu~~

Note: The test sample equivalent to STD , Part number: EFB0812HHB-F00

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DC FAN FUNCTION TEST RECORD
FOR LIFE EXPERIMENT

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	EFB0812HHB	EFB0824HHB	EFB0812HB-7K78		
	EFB0812HB	EFB0824HB			
	EFB0812MB	EFB0824MB			
	EFB0812LB	EFB0824LB			

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
3,478	2004/4/25 6:00 PM	2004/10/27 11:16 PM	56	0	**3478.0**

Representative Test P/N :EFB0812HHB-F00	Current Test Status	☐ In process	☐ In process (exceed requested)	☑ Termination
Equipment: 1.Oven: E24-F0030		On/Off Cycles: Every 500 hours		

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) **0.35Max.**	Final Test Current Spec. (A) **0.35Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **3496-4104**	Final Test Speed Spec. (RPM) **3496-4104**	Deviation (%)	Initial Test Noise Spec. (dB A) **45.0Max**	Final Test Noise Spec. (dB A) **45.0Max**	Deviation (%)
1	0.34	0.32	-5.9	3897	3947	1.3	41.7	42.3	1.4
2	0.32	0.31	-3.1	3793	3978	4.9	41.9	41.6	-0.7
3	0.32	0.33	3.1	3844	3949	2.7	42.0	41.5	-1.2
4	0.32	0.34	6.3	3801	3867	1.7	41.6	41.6	0.0
5	0.32	0.32	0.0	3812	3880	1.8	41.4	41.6	0.5
6	0.33	0.33	0.0	3766	3886	3.2	41.7	41.3	-1.0
7	0.33	0.33	0.0	3753	3841	2.3	41.9	41.5	-1.0
8	0.32	0.33	3.1	3839	3959	3.1	41.4	41.4	0.0
9	0.32	0.33	3.1	3855	3985	3.4	42.0	41.5	-1.2
10	0.34	0.34	0.0	3844	3909	1.7	41.7	41.6	-0.2
11	0.32	0.33	3.1	3822	3923	2.6	41.9	41.5	-1.0
12	0.32	0.34	6.3	3799	3860	1.6	41.4	41.7	0.7
13	0.31	0.33	6.5	3870	3916	1.2	41.5	41.5	0.0
14	0.32	0.31	-3.1	3814	3914	2.6	42.0	41.3	-1.7
15	0.34	0.34	0.0	3643	3881	6.5	42.1	41.6	-1.2
16	0.31	0.32	3.2	3837	3838	0.0	41.7	41.2	-1.2
17	0.32	0.33	3.1	3777	3932	4.1	41.5	41.4	-0.2
18	0.34	0.32	-5.9	3610	3813	5.6	41.3	41.6	0.7
19	0.34	0.34	0.0	3882	3897	0.4	41.6	41.5	-0.2
20	0.32	0.33	3.1	3769	3811	1.1	42.0	41.3	-1.7
21	0.35	0.33	-5.7	3584	3819	6.6	42.1	41.5	-1.4
22	0.33	0.33	0.0	3739	3910	4.6	41.9	41.4	-1.2
23	0.33	0.31	-6.1	3659	3846	5.1	41.7	41.6	-0.2
24	0.32	0.32	0.0	3838	3842	0.1	41.8	41.5	-0.7
25	0.32	0.33	3.1	3802	3881	2.1	41.6	41.8	0.5
26	0.32	0.31	-3.1	3778	3913	3.6	42.1	41.6	-1.2
27	0.33	0.34	3.0	3726	3938	5.7	42.0	41.5	-1.2
28	0.33	0.32	-3.0	3765	3889	3.3	41.8	41.4	-1.0
29	0.33	0.33	0.0	3739	3848	2.9	41.3	41.5	0.5
30	0.32	0.33	3.1	3839	3852	0.3	41.7	41.8	0.2
31	0.31	0.31	0.0	3829	3868	1.0	41.6	41.6	0.0
32	0.31	0.32	3.2	3823	3977	4.0	42.0	41.4	-1.4
33	0.32	0.34	6.3	3777	3762	-0.4	42.1	41.5	-1.4
34	0.33	0.33	0.0	3737	3857	3.2	41.9	41.3	-1.4
35	0.32	0.31	-3.1	3804	3817	0.3	41.4	41.9	1.2

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG04FNL115	**967.50**	**2004/10/27 11:30 PM**	**Huiling.Fu**	**Even.Liu**

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DC FAN FUNCTION TEST RECORD
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	EFB0812HB	EFB0824HB			
	EFB0812MB	EFB0812MB			
	EFB0812LB	EFB0824LB			

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
3,478	2004/4/25 6:00 PM	2004/10/27 11:16 PM	56	0	**3478.0**

Representative Test P/N :EFB0812HHB-F00	Current Test Status	☐ In process	☐ In process (exceed requested)	☑ Termination
Equipment: 1.Oven: E24-F0030		On/Off Cycles: Every 500 hours		

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) **0.35Max.**	Final Test Current Spec. (A) **0.35Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **3496-4104**	Final Test Speed Spec. (RPM) **3496-4104**	Deviation (%)	Initial Test Noise Spec. (dB A) **45.0Max**	Final Test Noise Spec. (dB A) **45.0Max**	Deviation (%)
36	0.32	0.33	3.1	3785	3840	1.5	41.1	41.5	1.0
37	0.32	0.33	3.1	3796	3709	-2.3	41.5	41.6	0.2
38	0.32	0.32	0.0	3782	3747	-0.9	41.3	41.4	0.2
39	0.33	0.31	-6.1	3803	3878	2.0	41.7	41.5	-0.5
40	0.31	0.31	0.0	3813	3861	1.3	41.2	41.6	1.0
41	0.32	0.32	0.0	3814	3805	-0.2	41.1	41.3	0.5
42	0.32	0.31	-3.1	3827	3768	-1.5	41.3	41.5	0.5
43	0.32	0.33	3.1	3812	3900	2.3	41.2	41.6	1.0
44	0.34	0.33	-2.9	3709	3905	5.3	41.4	41.4	0.0
45	0.32	0.33	3.1	3790	3826	0.9	41.6	41.6	0.0
46	0.33	0.32	-3.0	3734	3865	3.5	41.5	41.7	0.5
47	0.31	0.33	6.5	3821	3913	2.4	41.1	41.5	1.0
48	0.31	0.31	0.0	3832	3869	1.0	42.5	41.4	-2.6
49	0.31	0.33	6.5	3884	3909	0.6	42.0	41.6	-1.0
50	0.31	0.31	0.0	3895	3900	0.1	42.1	41.5	-1.4
51	0.31	0.32	3.2	3872	3825	-1.2	42.2	41.3	-2.1
52	0.32	0.32	0.0	3789	3853	1.7	42.0	41.4	-1.4
53	0.31	0.31	0.0	3853	3794	-1.5	42.1	41.6	-1.2
54	0.33	0.33	0.0	3694	3867	4.7	41.9	41.4	-1.2
55	0.31	0.32	3.2	3833	3872	1.0	42.0	41.4	-1.4
56	0.31	0.31	0.0	3825	3834	0.2	41.8	41.8	0.0
X-Bar	0.322	0.324	-	3793.7	3869.7	-	41.71	41.53	-
σ	0.010	0.010	-	66.357	57.600	-	0.325	0.176	-

QE File No.	Time-out for function test or others (hrs)	Issued Date	Reported By	Approved By
DG04FNL115	**967.50**	**2004/10/27 11:30 PM**	**Huiling.Fu**	**Even.Liu**