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 **AFB90x90x15 mm** series as the right table	AFB0912HHB	AFB0912HB	AFB0912MB	AFB0912LB	

Representative Test P/N :AFB0912HHB-F00

Equipment: 1.Oven: E24-F0052	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/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	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)
2004/5/31 6:30 PM	2005/5/9 10:33 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 Restult	☑ Accept ☐ Reject

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG04FNL158	1280.50	2005/5/9 11:00 PM	Guie.Lin	gx.xu

Note: The test sample equivalent to STD , Part umber: AFB0912HHB-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)	
6,956	2004/5/31 6:30 PM	2005/5/9 10:33 PM	56	0	**6956.0**	
Representative Test P/N :AFB0912HHB-F00		**Current Test Status**	☐ In process	☐ In process (exceed requested)	☑ Termination	
Equipment: 1.Oven: E24-F0052			On/Off Cycles: Every 500 hours			

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) **0.36Max.**	Final Test Current Spec. (A) **0.36Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **3036-3564**	Final Test Speed Spec. (RPM) **3036-3564**	Deviation (%)	Initial Test Noise Spec. (dB A) **44.5Max**	Final Test Noise Spec. (dB A) **44.5Max**	Deviation (%)
	0.32	0.32	0.0	3488	3482	-0.2	41.9	41.7	-0.5
	0.29	0.30	3.4	3430	3401	-0.8	42.1	41.7	-1.0
	0.28	0.28	0.0	3389	3399	0.3	41.2	41.3	0.2
	0.30	0.30	0.0	3405	3449	1.3	41.3	41.9	1.5
	0.31	0.31	0.0	3354	3476	3.6	41.5	41.2	-0.7
	0.30	0.30	0.0	3423	3444	0.6	41.6	41.0	-1.4
	0.30	0.31	3.3	3413	3360	-1.6	41.7	41.2	-1.2
	0.29	0.29	0.0	3393	3380	-0.4	42.3	41.7	-1.4
	0.30	0.30	0.0	3397	3369	-0.8	42.4	41.5	-2.1
	0.29	0.30	3.4	3412	3386	-0.8	42.5	41.6	-2.1
	0.31	0.30	-3.2	3415	3487	2.1	41.9	41.2	-1.7
	0.30	0.31	3.3	3419	3370	-1.4	41.3	41.5	0.5
	0.29	0.30	3.4	3431	3371	-1.7	41.2	41.7	1.2
	0.31	0.31	0.0	3421	3398	-0.7	41.4	41.5	0.2
	0.31	0.32	3.2	3421	3351	-2.0	41.7	41.2	-1.2
	0.30	0.30	0.0	3421	3424	0.1	42.0	42.0	0.0
	0.29	0.30	3.4	3332	3448	3.5	41.7	41.5	-0.5
	0.28	0.28	0.0	3382	3336	-1.4	41.4	41.2	-0.5
	0.30	0.30	0.0	3375	3335	-1.2	41.1	41.9	1.9
	0.29	0.28	-3.4	3247	3351	3.2	42.0	42.2	0.5
	0.28	0.29	3.6	3338	3382	1.3	41.4	41.8	1.0
	0.29	0.29	0.0	3247	3345	3.0	41.5	41.5	0.0
	0.30	0.30	0.0	3380	3379	0.0	41.9	41.7	-0.5
	0.30	0.30	0.0	3405	3345	-1.8	41.3	41.3	0.0
	0.29	0.28	-3.4	3440	3443	0.1	41.4	41.6	0.5
	0.29	0.30	3.4	3419	3446	0.8	41.7	41.9	0.5
	0.29	0.29	0.0	3327	3337	0.3	41.2	42.1	2.2
	0.31	0.31	0.0	3400	3470	2.1	42.1	41.7	-1.0
	0.29	0.29	0.0	3396	3433	1.1	41.5	41.3	-0.5
	0.30	0.30	0.0	3336	3424	2.6	41.6	41.5	-0.2
	0.30	0.30	0.0	3470	3437	-1.0	41.7	41.9	0.5
	0.28	0.28	0.0	3292	3347	1.7	41.4	42.1	1.7
	0.30	0.30	0.0	3426	3479	1.5	41.5	42.3	1.9
	0.30	0.29	-3.3	3337	3424	2.6	41.0	41.7	1.7
	0.30	0.30	0.0	3402	3409	0.2	41.3	41.5	0.5

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG04FNL158	**1280.50**	**2005/5/9 11:00 PM**	**Guie.Lin**	**gx.xu**

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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	2004/5/31 6:30 PM	2005/5/9 10:33 PM	56	0	**6956.0**

Representative Test P/N :AFB0912HHB-F00	**Current Test Status**	☑ In process	☐ In process (exceed requested)	☐ Termination
Equipment: 1.Oven: E24-F0052		On/Off Cycles: Every 500 hours		

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) **0.36Max.**	Final Test Current Spec. (A) **0.36Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **3036-3564**	Final Test Speed Spec. (RPM) **3036-3564**	Deviation (%)	Initial Test Noise Spec. (dB A) **44.5Max**	Final Test Noise Spec. (dB A) **44.5Max**	Deviation (%)
	0.28	0.28	0.0	3342	3353	0.3	42.1	41.3	-1.9
	0.29	0.29	0.0	3411	3389	-0.6	41.8	41.5	-0.7
	0.29	0.29	0.0	3340	3478	4.1	41.6	41.2	-1.0
	0.29	0.28	-3.4	3245	3425	5.5	41.1	41.0	-0.2
	0.29	0.30	3.4	3403	3398	-0.1	41.4	41.7	0.7
	0.30	0.30	0.0	3360	3388	0.8	41.6	41.5	-0.2
	0.28	0.29	3.6	3357	3450	2.8	41.3	41.6	0.7
	0.29	0.30	3.4	3364	3433	2.1	41.2	42.1	2.2
	0.29	0.30	3.4	3389	3393	0.1	41.7	42.0	0.7
	0.28	0.29	3.6	3354	3449	2.8	41.4	41.8	1.0
	0.28	0.29	3.6	3430	3420	-0.3	41.5	41.5	0.0
	0.29	0.29	0.0	3399	3344	-1.6	41.6	41.3	-0.7
	0.30	0.29	-3.3	3397	3377	-0.6	41.7	41.0	-1.7
	0.29	0.29	0.0	3349	3392	1.3	41.4	41.7	0.7
	0.30	0.29	-3.3	3423	3420	-0.1	41.3	41.2	-0.2
	0.28	0.30	7.1	3319	3357	1.1	41.5	41.8	0.7
	0.27	0.28	3.7	3217	3489	8.5	41.2	41.6	1.0
	0.28	0.28	0.0	3377	3486	3.2	41.1	41.4	0.7
	0.28	0.28	0.0	3341	3411	2.1	41.4	41.5	0.2
	0.29	0.28	-3.4	3357	3358	0.0	41.6	41.3	-0.7
	0.30	0.31	3.3	3361	3367	0.2	41.5	41.5	0.0
X-Bar	0.293	0.295	-	3377.1	3405.3	-	41.57	41.57	-
σ	0.010	0.010	-	54.635	45.936	-	0.336	0.312	-

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DG04FNL158	**1280.50**	**2005/5/9 11:00 PM**	**Guie.Lin**	**gx.xu**