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 ARxx or AFxx series suffixes. This test report applies to AFB**40x40x10.0 mm** series as the right table	AFB0405VHA	AFB0405HHA	AFB0405HA	AFB0405MA	AFB0405LA

Representative Test P/N : AFB0405VHA-A

Equipment: 1.Oven: E24-F0053 ; 2. DC Source: E11-FD413

◎ **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)
70	40	8.00	56	2.303	3,478	5,478.0	771,820	110,260

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2007/3/8 11:00 AM	2007/11/9 11:16 PM	☐ In process	☐ In process (exceed requested)	☑ Termination	5478.0

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	2,183,036	311,862
30	16.00	1,543,639	220,520
40	8.00	771,820	110,260
50	4.00	385,910	55,130
60	2.00	192,955	27,565
70	1.00	96,477	13,782

Fan permission criteria for the measurement after test :
1. Speed can not drop of ≧ 15% below the original measured rpm.
2. Current cannot increase > 15% of original measure current.
3. Noise cannot >3dB over the original measure noise.

Test Result	☑ Accept ☐ Reject

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG07FNL042	2438.50	2008/2/2	Nan Yang	Zenny Lei

DELTA ELECTRONICS, INC.

DC FAN FUNCTION TEST RECORD
FOR LIFE EXPERIMENT

Available for these models with lower speed and same physical structure. All model may be followed by ARxx or AFxx series suffixes. This test report applies to AFB40x40x10.0 mm series as the right table	AFB0405VHA	AFB0405HHA	AFB0405HA	AFB0405MA	AFB0405LA

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)	
3,478	2007/3/8 11:00 AM	2007/11/9 11:16 PM	56	0	**5478.0**	
Representative Test P/N : AFB0405VHA-A		**Current Test Status**	☐ In process	☐ In process (exceed requested)	☑ Termination	
Equipment: 1.Oven: E24-F0053 ; 2. DC Source: E11-FD413						

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (mA) **160 Max.**	Final Test Current Spec. (mA) **160 Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **7200-8800**	Final Test Speed Spec. (RPM) **7200-8800**	Deviation (%)	Initial Test Noise Spec. (dB A) **40.0Max**	Final Test Noise Spec. (dB A) **40.0Max**	Deviation **3 dBMax.**
1	130	105	-19.2	7613	8674	13.9	32.0	34.3	2.3
2	134	106	-20.9	7396	8546	15.5	31.7	34.5	2.8
3	128	105	-18.0	7368	8650	17.4	31.8	34.1	2.3
4	134	106	-20.9	7379	8492	15.1	32.2	34.8	2.6
5	160	107	-33.1	7674	8555	11.5	31.3	34.2	2.9
6	136	108	-20.6	7380	8465	14.7	32.0	34.6	2.6
7	134	104	-22.4	7475	8520	14.0	32.1	34.9	2.8
8	131	104	-20.6	7447	8420	13.1	31.9	34.2	2.3
9	131	101	-22.9	7578	8534	12.6	31.6	34.5	2.9
10	132	104	-21.2	7574	8429	11.3	31.7	34.1	2.4
11	129	106	-17.8	7771	8599	10.7	32.0	34.3	2.3
12	133	107	-19.5	7252	8563	18.1	31.9	34.1	2.2
13	132	108	-18.2	7583	8476	11.8	32.1	34.8	2.7
14	130	103	-20.8	7288	8489	16.5	31.7	34.0	2.3
15	140	105	-25.0	7349	8546	16.3	32.2	34.7	2.5
16	125	109	-12.8	7874	8638	9.7	32.1	34.9	2.8
17	138	103	-25.4	7416	8650	16.6	32.5	34.3	1.8
18	128	108	-15.6	7629	8476	11.1	32.1	34.5	2.4
19	136	108	-20.6	7360	8489	15.3	31.8	34.0	2.2
20	130	103	-20.8	7546	8639	14.5	31.7	33.9	2.2
21	127	107	-15.7	7765	8490	9.3	32.1	33.1	1.0
22	134	104	-22.4	7428	8613	16.0	31.5	33.7	2.2
23	153	106	-30.7	8046	8490	5.5	32.5	33.9	1.4
24	135	106	-21.5	7523	8613	14.5	31.7	34.5	2.8
25	136	105	-22.8	7435	8661	16.5	31.8	34.2	2.4
26	135	102	-24.4	7349	8291	12.8	32.1	34.7	2.6
27	125	104	-16.8	7845	8661	10.4	32.3	34.1	1.8
28	137	108	-21.2	7379	8479	14.9	31.9	34.2	2.3
29	124	107	-13.7	7588	8587	13.2	32.1	33.9	1.8
30	136	103	-24.3	7358	8420	14.4	31.8	33.7	1.9
31	135	107	-20.7	7390	8490	14.9	31.7	34.2	2.5
32	135	105	-22.2	7385	8638	17.0	31.7	34.1	2.4
33	135	105	-22.2	7453	8639	15.9	32.5	33.9	1.4
34	128	106	-17.2	7677	8599	12.0	32.7	34.2	1.5
35	138	103	-25.4	7492	8606	14.9	31.9	33.6	1.7

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG07FNL042	**2438.50**	**2008/2/2**	**Nan Yang**	**Zenny Lei**

DELTA ELECTRONICS, INC.

DC FAN FUNCTION TEST RECORD
FOR LIFE EXPERIMENT

Available for these models with lower speed and same physical structure. All model may be followed by ARxx or AFxx series suffixes. This test report applies to AFB40x40x10.0 mm series as the right table	AFB0405VHA	AFB0405HHA	AFB0405HA	AFB0405MA	AFB0405LA

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)	
3,478	2007/3/8 11:00 AM	2007/11/9 11:16 PM	56	0	**5478.0**	
Representative Test P/N : AFB0405VHA-A		**Current Test Status**		☐ In process	☐ In process (exceed requested)	☑ Termination
Equipment: 1.Oven: E24-F0053 ; 2. DC Source: E11-FD413						

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (mA)	Final Test Current Spec. (mA)	Deviation (%)	Initial Test Speed Spec. (RPM)	Final Test Speed Spec. (RPM)	Deviation (%)	Initial Test Noise Spec. (dB A)	Final Test Noise Spec. (dB A)	Deviation
	160 Max.	**160 Max.**		**7200-8800**	**7200-8800**		**40.0Max**	**40.0Max**	**3 dBMax.**
36	133	104	-21.8	7543	8660	14.8	33.1	34.0	0.9
37	130	105	-19.2	7637	8492	11.2	32.1	33.9	1.8
38	134	107	-20.1	7391	8490	14.9	31.8	33.3	1.5
39	135	105	-22.2	7338	8661	18.0	32.0	34.2	2.2
40	127	107	-15.7	7813	8618	10.3	32.1	33.5	1.4
41	135	106	-21.5	7483	8606	15.0	31.8	34.2	2.4
42	136	105	-22.8	7345	8520	16.0	31.8	34.7	2.9
43	136	106	-22.1	7386	8624	16.8	32.0	34.4	2.4
44	135	105	-22.2	7382	8660	17.3	31.7	34.5	2.8
45	139	105	-24.5	7387	8641	17.0	32.2	34.8	2.6
46	131	104	-20.6	7393	8420	13.9	32.1	34.2	2.1
47	134	108	-19.4	7424	8447	13.8	32.0	34.0	2.0
48	132	106	-19.7	7577	8624	13.8	31.7	33.7	2.0
49	138	107	-22.5	7379	8555	15.9	32.2	34.3	2.1
50	134	108	-19.4	7365	8618	17.0	31.5	34.2	2.7
51	138	106	-23.2	7439	8534	14.7	31.8	34.7	2.9
52	140	106	-24.3	7394	8291	12.1	32.0	34.9	2.9
53	134	105	-21.6	7290	8420	15.5	32.1	34.1	2.0
54	133	102	-23.3	7344	8587	16.9	32.5	34.9	2.4
55	153	108	-29.4	7532	8429	11.9	32.0	34.3	2.3
56	134	103	-23.1	7454	8563	14.9	32.1	34.5	2.4
X-Bar	134.4	105.5	-	7488.6	8546.2	-	31.99	34.23	-
σ	6.312	1.829	-	164.469	92.782	-	0.313	0.406	-

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DG07FNL042	**2438.50**	**2008/2/2**	**Nan Yang**	**Zenny Lei**