DC FAN LIFE EXPERIMENT REPORT

DELTA ELECTRONICS, INC.

Available for these models with lower speed and same physical structure. All model may be followed byRxx orFxx series suffixes. This test report applies to THD 240x240x100.0**mm** series as the right table					

Representative Test P/N : THD2348MU-00DXT	
Equipment: 1.Oven: E24-T0161	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	30	2.303	6,137	360.0	28,743	4,106

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2018/8/13 11:00 AM	2019/4/30 5:14 PM	☑ In process	☐ In process (exceed requested)	☐ Termination	**360.0**

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	81,296	11,614
30	16.00	57,485	8,212
40	8.00	28,743	4,106
50	4.00	14,371	2,053
60	2.00	7,186	1,027
70	1.00	3,593	513

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
DG18FNL085	**109.00**	**2018/9/2**	**Loly.Wang**	**Tim.Yi**

BGN（dBA）: 16.3   Temp（℃）: 21.2

DC FAN FUNCTION TEST RECORD
FOR LIFE EXPERIMENT

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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)
6,137	2018/8/13 11:00 AM	2019/4/30 5:14 PM	30	0	**360.0**

Representative Test P/N : THD2348MU-00DXT	Current Test Status	☑ In process	☐ In process (exceed requested)	☐ Termination

Equipment: 1.Oven: E24-T0161 | On/Off Cycles: Every 500 hours

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) 4.79 Max.	Final Test Current Spec. (A) 4.79 Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 4500-5500	Final Test Speed Spec. (RPM) 4500-5500	Deviation (%)	Initial Test Noise Spec. (dB A) 74.0 Max	Final Test Noise Spec. (dB A) 74.0 Max	Deviation 3 dBMax.
1	3.86	3.97	2.8	5025	5037	0.2	69.3	70.2	0.9
2	3.93	3.92	0.0	5042	5068	0.5	69.5	70.0	0.5
3	3.95	3.94	-0.2	5067	5033	-0.7	70.1	69.5	-0.6
4	3.81	3.94	3.3	5064	5039	-0.5	70.5	69.4	-1.1
5	3.97	3.93	-1.1	5025	5067	0.8	69.3	69.8	0.5
6	3.98	3.86	-3.0	5050	5068	0.4	69.0	69.4	0.4
7	3.87	3.81	-1.3	5069	5027	-0.8	69.6	69.3	-0.3
8	4.00	3.86	-3.5	4965	5049	1.7	69.8	69.7	-0.1
9	4.00	3.95	-1.1	4998	5067	1.4	69.3	69.8	0.5
10	3.65	3.92	7.5	4963	5069	2.1	69.7	69.5	-0.2
11	3.95	3.97	0.5	5027	5059	0.6	70.5	69.2	-1.3
12	3.96	3.93	-0.9	5074	5061	-0.3	70.6	69.7	-0.9
13	3.97	3.92	-1.3	5067	5037	-0.6	69.2	68.5	-0.7
14	4.12	4.01	-2.6	5036	5028	-0.2	69.3	69.1	-0.2
15	4.02	4.03	0.2	5012	4992	-0.4	69.8	69.0	-0.8
16	4.06	4.02	-1.1	5041	5027	-0.3	69.5	68.7	-0.8
17	3.87	3.95	2.2	5028	5061	0.7	69.3	69.5	0.2
18	3.97	3.98	0.2	5067	4998	-1.4	68.9	69.7	0.8
19	3.97	3.96	-0.3	5034	5037	0.1	68.2	69.3	1.1
20	3.95	3.87	-2.2	5050	5066	0.3	68.7	69.5	0.8
21	3.97	3.84	-3.2	4991	5037	0.9	68.5	69.1	0.6
22	3.96	3.89	-1.8	4993	5047	1.1	69.2	69.8	0.6
23	3.93	3.97	1.0	4927	5079	3.1	70.2	69.7	-0.5
24	3.97	3.94	-0.8	5064	5081	0.3	70.8	70.5	-0.3
25	4.02	3.95	-1.7	5017	5067	1.0	69.3	70.1	0.8
26	4.02	4.00	-0.6	5059	5077	0.4	69.1	69.8	0.7
27	4.01	3.96	-1.1	5067	5092	0.5	69.8	69.5	-0.3
28	3.70	3.93	6.2	5091	5061	-0.6	69.9	69.6	-0.3
29	3.96	3.98	0.6	5066	5044	-0.4	69.9	69.4	-0.5
30	3.65	3.94	7.9	5034	5039	0.1	69.4	69.0	-0.4
X-Bar	3.93	3.94	-	5033.77	5050.47	-	69.54	69.51	-
σ	0.11	0.05	-	37.84	23.15	-	0.61	0.41	-

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG18FNL085	**109.00**	**2018/9/2**	**Loly.Wang**	**Tim.Yi**