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 80x80x38.0 **mm** series as the right table				

Representative Test P/N : THD0848ME-00ACD

Equipment: 1.Oven: E24-T0165	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)
75	40	11.31	30	2.303	4,340	2,360.0	266,471	38,067

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2016/4/22 2:30 PM	2017/1/6 11:40 AM	☑ In process	☐ In process (exceed requested)	☐ Termination	2360.0

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.

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.

Temperature for MTTF Estimation (℃)	Acceleration Factor A$_F$	Estimated MTTF (hours)	Estimated L$_{10}$ (hours)
25	32.00	753,694	107,671
30	22.63	532,942	76,135
40	11.31	266,471	38,067
50	5.66	133,236	19,034
60	2.83	66,618	9,517
70	1.41	33,309	4,758
75	1.00	23,553	3,365

Test Result	☑ **Accept**
	☐ **Reject**

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG16FNL034	1873.50	2016/10/16	NaNa.Wang	Tim.Yi

BGN（dBA）: 16.1   Temp（℃）: 24.2

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)
4,340	2016/4/22 2:30 PM	2017/1/6 11:40 AM	30	0	**2360.0**

Representative Test P/N : THD0848ME-00ACD	Current Test Status	☑ In process	☐ In process (exceed requested)	☐ Termination

Equipment: 1.Oven: E24-T0165	On/Off Cycles: Every 500 hours

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (mA) 750Max.	Final Test Current Spec. (mA) 750Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 8550-20450	Final Test Speed Spec. (RPM) 8550-20450	Deviation (%)	Initial Test Noise Spec. (dB A) 64.0 Max	Final Test Noise Spec. (dB A) 64.0 Max	Deviation 3 dBMax.
1	555	544	-2.0	9611	9665	0.6	59.4	60.3	0.9
2	551	620	12.5	9622	9655	0.3	59.2	60.8	1.6
3	540	522	-3.3	9617	9648	0.3	58.8	60.9	2.1
4	555	602	8.5	9610	9639	0.3	58.7	59.1	0.4
5	564	639	13.3	9640	9645	0.1	59.2	60.2	1.0
6	550	608	10.5	9669	9669	0.0	58.7	60.6	1.9
7	561	627	11.8	9640	9641	0.0	59.8	59.8	0.0
8	562	604	7.5	9643	9642	0.0	59.9	60.0	0.1
9	539	521	-3.3	9623	9673	0.5	59.3	60.1	0.8
10	571	614	7.5	9650	9642	-0.1	59.5	59.9	0.4
11	549	626	14.0	9588	9672	0.9	59.1	60.5	1.4
12	573	614	7.2	9589	9659	0.7	59.5	60.0	0.5
13	533	516	-3.2	9641	9641	0.0	59.9	60.0	0.1
14	559	617	10.4	9642	9635	-0.1	59.6	60.9	1.3
15	594	632	6.4	9590	9630	0.4	59.5	60.6	1.1
16	522	536	2.7	9582	9643	0.6	59.4	60.7	1.3
17	543	618	13.8	9561	9642	0.8	58.9	60.7	1.8
18	567	611	7.8	9587	9649	0.6	59.1	59.7	0.6
19	554	627	13.2	9634	9618	-0.2	59.9	60.1	0.2
20	548	614	12.0	9587	9627	0.4	59.6	59.6	0.0
21	535	608	13.6	9603	9618	0.2	59.4	59.6	0.2
22	590	619	4.9	9597	9653	0.6	59.8	60.0	0.2
23	576	618	7.3	9631	9648	0.2	59.1	60.4	1.3
24	565	619	9.6	9586	9652	0.7	59.9	60.4	0.5
25	601	636	5.8	9635	9636	0.0	59.8	60.2	0.4
26	548	620	13.1	9614	9632	0.2	59.7	59.9	0.2
27	545	607	11.4	9616	9626	0.1	59.3	61.0	1.7
28	548	604	10.2	9622	9665	0.4	59.8	60.2	0.4
29	578	629	8.8	9610	9668	0.6	59.3	60.8	1.5
30	577	636	10.2	9624	9628	0.0	59.6	60.7	1.1
X-Bar	558.43	603.60		9615.47	9645.37		59.42	60.23	
σ	18.46	34.26		24.77	15.05		0.36	0.46	

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG16FNL034	**1873.50**	**2016/10/16**	**NaNa.Wang**	**Tim.Yi**