DELTA ELECTRONICS, INC.

DC FAN LIFE EXPERIMENT REPORT

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 QFR 92x92x25.0**mm** series as the right table					
Representative Test P/N : QFR0912GJ-00P0					
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 70℃**

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 70 ℃ (hours)	Verified L_{10} 70 ℃ (hours)
80	70	2.00	56	2.303	13,911	3,360.0	118,351	16,907

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2020/6/1 4:00 PM	2022/3/22 3:07 PM	☑ In process	☐ In process (exceed requested)	☐ Termination	**3360.0**

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	45.25	2,677,985	382,569
30	32.00	1,893,621	270,517
40	16.00	946,811	135,259
50	8.00	473,405	67,629
60	4.00	236,703	33,815
70	2.00	118,351	16,907
80	1.00	59,176	8,454

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
DG20FNL038	1904.00	2021/1/7	Loly.Wang	Tim.Yi

BGN（dBA）: 15.8 Temp（℃）: 21.0

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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)
13,911	2020/6/1 4:00 PM	2022/3/22 3:07 PM	56	0	**3360.0**

Representative Test P/N : QFR0912GJ-00P0	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) **0.82 Max.**	Final Test Current Spec. (A) **0.82 Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **5040-6160**	Final Test Speed Spec. (RPM) **5040-6160**	Deviation (%)	Initial Test Noise Spec. (dB A) **54.0 Max**	Final Test Noise Spec. (dB A) **54.0 Max**	Deviation **3 dBMax.**
1	0. 617	0. 620	0.5	5536	5431	-1.9	50.2	49.2	-1.0
2	0. 608	0. 624	2.6	5531	5512	-0.3	50.0	49.5	-0.5
3	0. 605	0. 617	2.0	5562	5506	-1.0	50.2	49.4	-0.8
4	0. 605	0. 617	2.0	5541	5450	-1.6	50.2	49.6	-0.6
5	0. 610	0. 640	4.9	5633	5475	-2.8	50.4	50.6	0.2
6	0. 623	0. 603	-3.2	5628	5526	-1.8	50.5	49.7	-0.8
7	0. 586	0. 609	3.9	5537	5543	0.1	49.6	49.6	0.0
8	0. 614	0. 615	0.2	5553	5444	-2.0	50.3	49.5	-0.8
9	0. 589	0. 615	4.4	5464	5466	0.0	50.0	50.2	0.2
10	0. 584	0. 634	8.6	5490	5512	0.4	50.2	50.1	-0.1
11	0. 612	0. 615	0.5	5608	5437	-3.0	49.9	50.0	0.1
12	0. 591	0. 619	4.7	5644	5486	-2.8	50.0	52.1	2.1
13	0. 605	0. 623	3.0	5608	5431	-3.2	50.1	50.8	0.7
14	0. 607	0. 631	4.0	5561	5518	-0.8	49.7	49.8	0.1
15	0. 610	0. 622	2.0	5551	5471	-1.4	50.3	50.3	0.0
16	0. 591	0. 618	4.6	5508	5421	-1.6	50.6	50.0	-0.6
17	0. 609	0. 643	5.6	5550	5457	-1.7	50.3	50.5	0.2
18	0. 603	0. 616	2.2	5538	5463	-1.4	49.9	49.3	-0.6
19	0. 619	0. 612	-1.1	5577	5516	-1.1	50.3	50.0	-0.3
20	0. 577	0. 616	6.8	5599	5423	-3.1	50.3	50.5	0.2
21	0. 587	0. 612	4.3	5553	5476	-1.4	50.4	50.3	-0.1
22	0. 609	0. 637	4.6	5574	5486	-1.6	49.9	49.6	-0.3
23	0. 616	0. 637	3.4	5587	5402	-3.3	50.3	49.8	-0.5
24	0. 601	0. 615	2.3	5545	5420	-2.3	50.5	50.5	0.0
25	0. 597	0. 638	6.9	5625	5477	-2.6	49.9	50.4	0.5
26	0. 624	0. 609	-2.4	5561	5495	-1.2	50.0	49.0	-1.0
27	0. 604	0. 612	1.3	5529	5428	-1.8	50.2	50.1	-0.1
28	0. 611	0. 618	1.1	5690	5478	-3.7	50.3	50.4	0.1
29	0. 598	0. 630	5.4	5569	5519	-0.9	49.8	50.6	0.8
30	0. 606	0. 614	1.3	5575	5471	-1.9	50.1	50.7	0.6
31	0. 602	0. 633	5.1	5507	5408	-1.8	50.0	49.6	-0.4
32	0. 612	0. 614	0.3	5516	5427	-1.6	49.8	50.3	0.5

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG20FNL038	**1904.00**	**2021/1/7**	**Loly.Wang**	**Tim.Yi**

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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)
13,911	2020/6/1 4:00 PM	2022/3/22 3:07 PM	56	0	**3360.0**

Representative Test P/N : QFR0912GJ-00P0	**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) **0.82 Max.**	Final Test Current Spec. (A) **0.82 Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **5040-6160**	Final Test Speed Spec. (RPM) **5040-6160**	Deviation (%)	Initial Test Noise Spec. (dB A) **54.0 Max**	Final Test Noise Spec. (dB A) **54.0 Max**	Deviation **3 dBMax.**
33	0. 615	0. 623	1.3	5550	5435	-2.1	50.5	50.5	0.0
34	0. 618	0. 630	1.9	5521	5513	-0.1	49.7	49.8	0.1
35	0. 613	0. 605	-1.3	5603	5468	-2.4	49.9	50.5	0.6
36	0. 581	0. 635	9.3	5606	5387	-3.9	50.7	50.4	-0.3
37	0. 600	0. 642	7.0	5647	5449	-3.5	49.9	50.7	0.8
38	0. 599	0. 613	2.3	5597	5482	-2.1	49.7	50.2	0.5
39	0. 608	0. 617	1.5	5548	5495	-1.0	49.3	49.5	0.2
40	0. 584	0. 608	4.1	5615	5437	-3.2	50.4	49.7	-0.7
41	0. 603	0. 637	5.6	5656	5480	-3.1	50.7	50.3	-0.4
42	0. 634	0. 613	-3.3	5567	5479	-1.6	50.5	50.2	-0.3
43	0. 620	0. 632	1.9	5563	5417	-2.6	50.2	50.0	-0.2
44	0. 603	0. 611	1.3	5552	5422	-2.3	49.8	49.0	-0.8
45	0. 592	0. 633	6.9	5541	5508	-0.6	50.1	49.6	-0.5
46	0. 600	0. 611	1.8	5529	5492	-0.7	49.7	49.8	0.1
47	0. 623	0. 623	0.0	5589	5459	-2.3	50.3	50.0	-0.3
48	0. 624	0. 608	-2.6	5556	5425	-2.4	50.0	49.5	-0.5
49	0. 607	0. 603	-0.7	5563	5531	-0.6	50.3	49.5	-0.8
50	0. 628	0. 640	1.9	5602	5472	-2.3	50.5	49.7	-0.8
51	0. 599	0. 613	2.3	5521	5458	-1.1	50.0	50.6	0.6
52	0. 638	0. 617	-3.3	5573	5504	-1.2	50.4	50.9	0.5
53	0. 631	0. 609	-3.5	5526	5505	-0.4	49.6	50.0	0.4
54	0. 633	0. 638	0.8	5537	5481	-1.0	50.5	50.5	0.0
55	0. 623	0. 621	-0.3	5609	5464	-2.6	50.3	51.0	0.7
56	0. 618	0. 613	-0.8	5519	5448	-1.3	50.1	49.6	-0.5
X-Bar	0.61	0.62	-	5566.79	5467.61	-	50.13	50.06	-
σ	0.01	0.01	-	44.35	36.46	-	0.30	0.55	-

QE File No.	Time-out for function test or others (hrs)	Issued Date	Reported By	Approved By
DG20FNL038	**1904.00**	**2021/1/7**	**Loly.Wang**	**Tim.Yi**