



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 GFC 40x40x56.0 mm series as the right table	GFC0412DS-SM06A25	GFC0412DS-SM06B0G		
	GFC0412DS-SM06X12	GFC0412DS-SM06B18		
	GFC0412DS-SM06AMU	GFC0412DS-SM06YYA		
	GFC0412DS-SM06ASC	GFC0412DS-DV17		

Representative Test P/N :GFC0412DS-SM06A01	
Equipment: 1.Oven: E24-T0179	On/Off Cycles: Every 500 hours

◎ **L₁₀ Expectancy: 70,000 hours minimum @ fan rated voltage and the temperature of 40°C**
 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,

$$t = 1.036 \times \text{MTTF} \times [(B_{r,c}) \div n]^{0.91} \div A_F, \text{ and } A_F = 2^{(T_s - T_u)/10}$$

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 T _s (°C) (Actual Test Temperature)	Unstress Temperature T _u (°C)	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 °C (hours)	Verified L ₁₀ 40 °C (hours)
80	40	16.00	56	2.303	1,739	8,360.0	2,355,755	336,536

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2014/8/11 10:00 AM	2014/11/12 12:53 PM	<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input checked="" type="checkbox"/> Termination	8360.0

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' L₁₀ 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 (°C)	Acceleration Factor A _F	Estimated MTTF (hours)	Estimated L ₁₀ (hours)
25	45.25	6,663,081	951,869
30	32.00	4,711,510	673,073
40	16.00	2,355,755	336,536
50	8.00	1,177,878	168,268
60	4.00	588,939	84,134
70	2.00	294,469	42,067
80	1.00	147,235	21,034

Fan permission criteria for the measurement after test :

- Speed can not drop of $\geq 15\%$ below the original measured rpm.
- Current cannot increase $> 15\%$ of original measure current.
- Noise cannot $> 3\text{dB}$ over the original measure noise.

Test Result	<input checked="" type="checkbox"/> Accept <input type="checkbox"/> Reject
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QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG14FNL107	2660.00	2016/2/25	Loly.Wang	Tim Yi

BGN (dBA) :15.9

Temp (°C) : 21.0



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	GFC0412DS-SM06X12	GFC0412DS-SM06B18		
	GFC0412DS-SM06AMU	GFC0412DS-SM06YYA		
	GFC0412DS-SM06ASC	GFC0412DS-DV17		

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
3,478	2014/8/11 10:00 AM	2014/11/12 12:53 PM	56	0	8360.0

Representative Test P/N :GFC0412DS-SM06A01	Current Test Status	<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input checked="" type="checkbox"/> Termination
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Equipment: 1.Oven: E24-T0179	On/Off Cycles: Every 500 hours
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Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A)	Final Test Current Spec. (A)	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
	2.8 Max.	2.8 Max.		21160-24840 18860-22140	21160-24840 18860-22140		73.0 Max	73.0 Max	
1	2.07	2.05	-0.7	23437 20408	22034 20631	-6.0 1.1	69.5	71.0	1.5
2	2.07	2.15	3.6	23428 20493	23135 20298	-1.3 -1.0	70.1	71.1	1.0
3	2.13	2.10	-1.3	23477 20711	23385 20306	-0.4 -2.0	68.5	70.0	1.5
4	2.12	2.11	-0.1	23369 20823	23339 20342	-0.1 -2.3	69.7	71.6	1.9
5	2.07	2.14	3.5	23410 21295	23272 20417	-0.6 -4.1	69.0	70.8	1.8
6	2.04	2.11	3.5	23407 20481	23379 20231	-0.1 -1.2	69.6	70.9	1.3
7	2.14	2.10	-1.7	23350 20517	23375 20259	0.1 -1.3	68.9	70.6	1.7
8	2.07	2.15	3.8	22210 20517	23362 20803	5.2 1.4	69.4	71.3	1.9
9	2.14	2.16	1.2	23461 20759	23635 20758	0.7 0.0	70.0	71.5	1.5
10	2.18	2.16	-1.1	23509 20905	23630 20748	0.5 -0.8	68.6	70.1	1.5
11	2.12	2.17	2.5	22067 20905	23626 20808	7.1 -0.5	69.1	70.3	1.2
12	1.98	2.16	9.1	22077 20905	23650 20721	7.1 -0.9	68.7	70.5	1.8
13	2.08	2.17	4.2	23568 20650	23636 20732	0.3 0.4	69.3	71.1	1.8
14	2.12	2.24	5.6	23500 20491	22455 20796	-4.4 1.5	69.5	70.6	1.1
15	2.18	2.15	-1.5	23490 20764	23500 20729	0.0 -0.2	69.7	70.8	1.1
16	2.11	2.17	2.7	23502 20593	23508 20733	0.0 0.7	69.9	71.4	1.5
17	2.15	2.13	-0.9	23660 20852	23849 20713	0.8 -0.7	70.1	71.6	1.5
18	2.15	2.12	-1.3	23401 21000	23587 20704	0.8 -1.4	68.5	70.0	1.5

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG14FNL107	2660.00	2016/2/25	Loly.Wang	Tim Yi



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	GFC0412DS-SM06AMU	GFC0412DS-SM06YYA			
	GFC0412DS-SM06ASC	GFC0412DS-DV17			

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
3,478	2014/8/11 10:00 AM	2014/11/12 12:53 PM	56	0	8360.0
Representative Test P/N :GFC0412DS-SM06A01			Current Test Status		<input type="checkbox"/> In process <input type="checkbox"/> In process (exceed requested) <input checked="" type="checkbox"/> Termination

Equipment: 1.Oven: E24-T0179	On/Off Cycles: Every 500 hours
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Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A)	Final Test Current Spec. (A)	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
	2.8 Max.	2.8 Max.		21160-24840 18860-22140	21160-24840 18860-22140		73.0 Max	73.0 Max	
19	2.10	2.12	1.0	23405	23531	0.5	69.0	70.2	1.2
				20339	20692	1.7			
20	2.13	2.24	5.0	23460	23239	-0.9	68.7	71.0	2.3
				20559	20705	0.7			
21	2.10	2.23	5.9	23487	23284	-0.9	69.2	70.4	1.2
				20640	20693	0.3			
22	2.08	2.24	7.6	23508	23081	-1.8	69.4	70.6	1.2
				20726	20728	0.0			
23	2.08	2.24	7.5	23500	23203	-1.3	69.6	71.3	1.7
				20732	20495	-1.1			
24	2.08	2.16	3.8	23501	23423	-0.3	70.0	70.7	0.7
				20758	20571	-0.9			
25	2.22	2.15	-3.2	22647	23456	3.6	69.7	70.9	1.2
				20635	20726	0.4			
26	2.11	2.18	3.3	23531	23383	-0.6	69.9	71.6	1.7
				20716	20461	-1.2			
27	2.09	2.16	3.0	23536	23422	-0.5	69.2	70.4	1.2
				20762	20510	-1.2			
28	2.09	2.14	2.1	23534	23434	-0.4	68.9	70.7	1.8
				20765	20411	-1.7			
29	2.04	2.12	4.0	23535	23527	0.0	68.6	70.1	1.5
				20950	20617	-1.6			
30	2.08	2.13	2.6	23530	23442	-0.4	68.8	70.3	1.5
				20789	20415	-1.8			
31	2.10	2.14	2.1	23535	23440	-0.4	69.1	70.5	1.4
				20748	20413	-1.6			
32	2.17	2.13	-1.7	23443	23466	0.1	69.3	71.2	1.9
				20772	20595	-0.9			
33	2.09	2.16	3.1	23505	23423	-0.3	69.8	70.2	0.4
				20719	20638	-0.4			
34	2.09	2.16	3.2	23509	23430	-0.3	68.7	70.4	1.7
				20788	20828	0.2			
35	2.08	2.17	4.5	23511	23219	-1.2	69.2	70.7	1.5
				20857	20778	-0.4			
36	2.08	2.14	2.7	23510	23260	-1.1	69.9	71.4	1.5
				20844	20805	-0.2			
37	2.03	2.14	5.5	23513	23330	-0.8	68.5	70.0	1.5
				21098	20789	-1.5			

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
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	2.8 Max.	2.8 Max.		21160-24840 18860-22140	21160-24840 18860-22140		73.0 Max	73.0 Max	
38	2.06	2.14	3.9	23510 20940	23018 20741	-2.1 -1.0	69.0	70.2	1.2
39	2.08	2.13	2.5	23510 20821	23171 20762	-1.4 -0.3	69.2	70.4	1.2
40	2.08	2.14	2.7	23513 20858	23353 20766	-0.7 -0.4	68.8	71.0	2.2
41	2.16	2.15	-0.5	23198 20531	23216 20776	0.1 1.2	69.4	71.2	1.8
42	2.14	2.15	0.5	23265 20647	23230 20745	-0.2 0.5	68.9	70.7	1.8
43	2.15	2.14	-0.6	23351 20618	23093 20705	-1.1 0.4	69.6	71.3	1.7
44	2.15	2.13	-0.8	23314 20698	23188 20497	-0.5 -1.0	69.8	71.5	1.7
45	2.14	2.05	-4.5	23269 20653	23560 20356	1.3 -1.4	70.0	70.9	0.9
46	2.14	2.07	-3.4	23243 20713	23472 20520	1.0 -0.9	68.6	70.1	1.5
47	2.14	2.10	-1.9	23285 20738	23435 20436	0.6 -1.5	69.1	70.3	1.2
48	2.12	2.08	-1.7	23307 20800	23453 20369	0.6 -2.1	68.8	71.1	2.3
49	2.14	2.08	-2.6	23228 20769	23444 20395	0.9 -1.8	69.3	70.5	1.2
50	2.14	2.08	-3.0	23285 20689	23442 20220	0.7 -2.3	68.9	71.2	2.3
51	2.14	2.10	-1.9	23306 20737	23442 20508	0.6 -1.1	69.5	71.4	1.9
52	2.15	2.07	-3.6	23280 20664	23451 20327	0.7 -1.6	70.1	70.8	0.7
53	2.13	2.09	-1.8	23372 20731	23442 20248	0.3 -2.3	69.8	71.5	1.7
54	2.11	1.95	-7.3	23385 20744	23443 21853	0.2 5.3	69.0	70.6	1.6
55	2.11	2.12	0.6	23388 20737	23531 20415	0.6 -1.6	69.4	70.5	1.1
56	2.15	2.24	3.9	23342 20746	23239 20413	-0.4 -1.6	69.6	70.9	1.3
X-Bar	16.805	2.137	-	22039.9	21978.786	-	69.29	70.784	-
σ	18.700	0.051	-	1337.146	1408.407	-	0.479	0.477	-

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