



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 GFC40x40x56.0 mm series as the right table	GFC0412DS-SP37(CD60)	GFC0412DS-SM06A01	GFC0412DS-DB54	GFC0412DS-SM06AHM	GFC0412DS-SM06A19
	GFC0412DS-SP10(CH85)	GFC0412DS-CD60	GFC0412DS-DA16	GFC0412DS-DA06	GFC0412DS-DU49
	GFC0412DS-SP44	GFC0412DS-SM06A04	GFC0412DS-SM06A02	GFC0412DS-SM06A24	
	GFC0412DS-SP56	GFC0412DS-SM06A05	GFC0412DS-CC50	GFC0412DS-SM06X18	

Representative Test P/N :GFC0412DS-BC39

Equipment: 1.Oven: E24-T0177 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 Ts (°C) (Actual Test Temperature)	Unstress Temperature Tu (°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)
60	40	4.00	56	2.303	6,956	19,360.0	1,363,858	194,837

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2011/6/14 9:00 AM	2013/6/5 1:33 PM	<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input checked="" type="checkbox"/> Termination	19360.0

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	11.31	3,857,573	551,082
30	8.00	2,727,716	389,674
40	4.00	1,363,858	194,837
50	2.00	681,929	97,418
60	1.00	340,965	48,709

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	<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
DG11FNL071	10377.00	2015/2/6	Loly.wang	Tim.Yi

BGN (dBA) :16.0

Temp (°C) : 22.1



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	GFC0412DS-SP10(CH85)	GFC0412DS-SM06A02	GFC0412DS-DA16	GFC0412DS-DA06	GFC0412DS-DU49
	GFC0412DS-SP44	GFC0412DS-SM06A04	GFC0412DS-SM06A02	GFC0412DS-SM06A24	
	GFC0412DS-SP56	GFC0412DS-SM06A05	GFC0412DS-CC50	GFC0412DS-SM06X18	

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
6,956	2011/6/14 9:00 AM	2013/6/5 1:33 PM	56	0	19360.0

Representative Test P/N :GFC0412DS-BC39	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-T0177 On/Off Cycles: Every 500 hours

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
	2.80 Max.	2.80 Max.		20700-25300 18450-22550	20700-25300 18450-22550		73.0 Max	73.0 Max	
1	2.33	2.07	-11.1	22956	22750	-0.9	71.6	71.9	0.3
				19275	19705	2.2			
2	2.21	1.93	-12.4	23256	22705	-2.4	71.0	70.1	-0.9
				20488	21446	4.7			
3	2.40	2.08	-13.4	22080	23055	4.4	70.9	71.0	0.1
				20052	19915	-0.7			
4	2.45	2.10	-14.5	21732	23152	6.5	70.8	72.2	1.4
				19631	19839	1.1			
5	2.43	2.07	-14.8	22109	22278	0.8	70.5	71.4	0.9
				19478	19729	1.3			
6	2.29	2.14	-6.4	22855	22465	-1.7	70.0	70.3	0.3
				18978	19539	3.0			
7	2.21	2.00	-9.4	22210	22758	2.5	70.1	71.3	1.2
				19509	19754	1.3			
8	2.26	2.03	-10.4	22070	22365	1.3	70.6	70.8	0.2
				20680	20303	-1.8			
9	2.30	2.07	-10.1	21954	22664	3.2	70.5	71.4	0.9
				19503	19788	1.5			
10	2.36	2.05	-13.2	21605	22131	2.4	70.6	70.1	-0.5
				20580	20173	-2.0			
11	2.28	2.06	-9.7	22122	22771	2.9	70.7	70.3	-0.4
				20248	19158	-5.4			
12	2.24	2.07	-7.5	22335	22604	1.2	70.9	71.0	0.1
				20406	19834	-2.8			
13	2.22	1.91	-14.1	23174	23255	0.3	70.2	70.5	0.3
				20449	21339	4.4			
14	2.24	2.08	-7.0	22807	23199	1.7	70.1	70.7	0.6
				20510	19856	-3.2			
15	2.24	2.19	-2.4	22882	22910	0.1	70.4	71.3	0.9
				20603	19615	-4.8			
16	2.07	1.89	-8.7	22681	24565	8.3	70.6	70.9	0.3
				22046	21222	-3.7			
17	2.20	2.04	-7.2	22231	22233	0.0	70.8	71.5	0.7
				20377	20461	0.4			
18	2.24	2.11	-5.9	23029	22705	-1.4	70.6	70.2	-0.4
				20178	20227	0.2			

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG11FNL071	10377.00	2015/2/6	Loly.wang	Tim.Yi



DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

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GFC0412DS-SP37(CD60)	GFC0412DS-SM06A01	GFC0412DS-DB54	GFC0412DS-SM06AHM	GFC0412DS-SM06A19
GFC0412DS-SP10(CH85)	GFC0412DS-SM06A02	GFC0412DS-DA16	GFC0412DS-DA06	GFC0412DS-DU49
GFC0412DS-SP44	GFC0412DS-SM06A04	GFC0412DS-SM06A02	GFC0412DS-SM06A24	
GFC0412DS-SP56	GFC0412DS-SM06A05	GFC0412DS-CC50	GFC0412DS-SM06X18	

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
6,956	2011/6/14 9:00 AM	2013/6/5 1:33 PM	56	0	19360.0

Representative Test P/N :GFC0412DS-BC39	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-T0177 On/Off Cycles: Every 500 hours

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
	2.80 Max.	2.80 Max.		20700-25300	20700-25300		73.0 Max	73.0 Max	
19	2.30	2.11	-8.3	22147	23255	5.0	70.7	70.4	-0.3
				20111	20252	0.7			
20	2.36	2.10	-11.1	22072	23055	4.5	70.6	71.1	0.5
				19776	20318	2.7			
21	2.30	2.04	-11.4	22583	22208	-1.7	70.7	70.5	-0.2
				20200	20191	0.0			
22	2.22	2.04	-8.2	23536	22183	-5.7	70.6	70.7	0.1
				19988	20688	3.5			
23	2.36	2.09	-11.5	22029	23113	4.9	70.7	71.3	0.6
				20051	20324	1.4			
24	2.29	2.04	-11.1	23256	22545	-3.1	70.5	70.9	0.4
				19844	19607	-1.2			
25	2.38	2.08	-12.6	22063	23055	4.5	70.7	71.5	0.8
				19556	20212	3.4			
26	2.43	2.17	-10.7	22430	22986	2.5	70.6	70.2	-0.4
				19628	20137	2.6			
27	2.25	2.12	-5.6	23558	23471	-0.4	70.6	70.6	0.0
				19936	20149	1.1			
28	2.24	2.08	-7.2	23055	23008	-0.2	70.6	70.8	0.2
				20621	20232	-1.9			
29	2.35	2.16	-7.8	22777	23175	1.7	70.7	70.2	-0.5
				20103	20230	0.6			
30	2.37	2.12	-10.7	22348	23259	4.1	70.4	70.4	0.0
				19650	20130	2.4			
31	2.24	2.10	-6.2	23402	22443	-4.1	70.6	71.1	0.5
				19908	20232	1.6			
32	2.30	2.16	-5.9	23579	23138	-1.9	70.4	70.5	0.1
				20561	19855	-3.4			
33	2.26	2.16	-4.3	22271	22208	-0.3	70.7	70.7	0.0
				20012	20564	2.8			
34	2.30	2.01	-12.8	21907	22548	2.9	70.3	71.2	0.9
				20705	19712	-4.8			
35	2.26	2.04	-9.7	22730	22321	-1.8	70.1	70.6	0.5
				19725	19725	0.0			
36	2.23	2.00	-10.3	22133	22067	-0.3	70.2	70.9	0.7
				20434	19668	-3.7			
37	2.32	2.04	-12.0	22294	22212	-0.4	70.3	71.5	1.2
				19828	19996	0.8			

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GFC0412DS-SP44	GFC0412DS-SM06A04	GFC0412DS-SM06A02	GFC0412DS-SM06A24	
GFC0412DS-SP56	GFC0412DS-SM06A05	GFC0412DS-CC50	GFC0412DS-SM06X18	

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
6,956	2011/6/14 9:00 AM	2013/6/5 1:33 PM	56	0	19360.0
Representative Test P/N :GFC0412DS-BC39			Current Test Status		<input type="checkbox"/> In process <input type="checkbox"/> In process (exceed requested) <input checked="" type="checkbox"/> Termination
Equipment: 1.Oven: E24-T0177				On/Off Cycles: Every 500 hours	

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
	2.80 Max.	2.80 Max.		20700-25300 18450-22550	20700-25300 18450-22550		73.0 Max	73.0 Max	
38	2.31	2.05	-11.4	22305	21016	-5.8	70.8	70.2	-0.6
				19251	19384	0.7			
39	2.24	2.13	-4.8	23280	22104	-5.1	70.9	70.4	-0.5
				19378	19380	0.0			
40	2.22	2.05	-7.8	22839	22218	-2.7	71.0	71.1	0.1
				20193	20150	-0.2			
41	2.28	2.11	-7.4	22857	22408	-2.0	71.1	70.6	-0.5
				20050	19766	-1.4			
42	2.33	2.08	-10.7	22580	22636	0.2	70.9	71.2	0.3
				19902	19733	-0.8			
43	2.25	2.02	-10.1	22731	22763	0.1	70.9	70.8	-0.1
				20129	20064	-0.3			
44	2.23	2.00	-10.3	22981	22445	-2.3	70.6	71.4	0.8
				20249	20146	-0.5			
45	2.40	2.15	-10.3	22356	23300	4.2	70.6	70.1	-0.5
				19971	19829	-0.7			
46	2.23	2.09	-6.5	23077	22183	-3.9	70.3	70.3	0.0
				20350	19284	-5.2			
47	2.21	2.18	-1.6	22526	23069	2.4	70.2	71.0	0.8
				19828	19895	0.3			
48	2.24	2.12	-5.5	22557	23236	3.0	70.6	71.2	0.6
				19979	19833	-0.7			
49	2.24	2.02	-9.7	23366	22672	-3.0	70.7	70.6	-0.1
				19979	19879	-0.5			
50	2.28	2.07	-9.5	22039	22768	3.3	70.3	70.8	0.5
				19533	19791	1.3			
51	2.26	2.13	-5.8	22114	23113	4.5	70.1	71.4	1.3
				19455	21284	9.4			
52	2.24	2.14	-4.6	23131	23326	0.8	70.7	71.0	0.3
				19204	19881	3.5			
53	2.26	2.07	-8.2	23205	22440	-3.3	70.3	71.6	1.3
				19695	20351	3.3			
54	2.41	2.26	-6.4	22187	22384	0.9	70.2	70.5	0.3
				19903	19898	0.0			
55	2.26	2.13	-5.7	23109	23040	-0.3	70.1	70.7	0.6
				19553	19951	2.0			
56	2.31	2.11	-8.7	22430	22430	0.0	70.1	71.1	1.0
				19871	19969	0.5			
X-Bar	2.284	2.079	-	21303.8	21383.563	-	70.56	35.748	-
σ	0.071	0.067	-	1401.212	1430.858	-	0.308	35.589	-

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