

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 GFC40x40x48.0 mm series as the right table	GFB0412GHG-DF00			
	GFB0412EHG-DF00			
	GFC0412DG-AK1Z			
	GFC0412DG-CMA4			
Representative Test P/N :GFC0412DG-DF00				
Equipment: 1.Oven: E24-T0164			On/Off Cycles: Every 500 hours	

◎ **L₁₀ Expectancy:** **50,000 hours minimum @ fan rated voltage and the temperature of 40℃**
According to the equation for **Weibull distribution**, **MTTF $\cong$ 7×L₁₀ = 350,000 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 (℃) (Actual Test Temperature)	Unstress Temperature T _u (℃)	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	56	2.303	2,484	15,485.0	2,181,750	311,679

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2009/4/11 5:00 PM	2010/6/7 12:07 AM	☐ In process	☐ In process (exceed requested)	☒ Termination	15485.0

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 (℃)	Acceleration Factor A _F	Estimated MTTF (hours)	Estimated L ₁₀ (hours)
25	22.63	6,170,922	881,560
30	16.00	4,363,501	623,357
40	8.00	2,181,750	311,679
50	4.00	1,090,875	155,839
60	2.00	545,438	77,920
70	1.00	272,719	38,960

Fan permission criteria for the measurement after test :

1. Speed can not drop of $\geq 15\%$ 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
DG09FNL038	7627.00	2011/12/5	Nan Yang	Tim Yi



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				GFB0412EHG-DF00					
				GFC0412DG-AK1Z					
				GFC0412DG-CMA4					
Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)				
2,484	2009/4/11 5:00 PM	2010/6/7 12:07 AM	56	0	15485.0				
Representative Test P/N :GFC0412DG-DF00				Current Test Status	☐ In process	☐ In process (exceed requested)	☒ Termination		
Equipment: 1.Oven: E24-T0164					On/Off Cycles: Every 500 hours				
Test Data Between Initial Test and Final Test									
Sample No.	Initial Test Current Spec. (A) 1.96 Max.	Final Test Current Spec. (A) 1.96 Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 13635-16665 12870-15730	Final Test Speed Spec. (RPM) 13635-16665 12870-15730	Deviation (%)	Initial Test Noise Spec. (dB A) 68.4 Max	Final Test Noise Spec. (dB A) 68.4 Max	Deviation 3 dBMax.
1	1.38	1.39	0.9	14894	15277	2.6	63.7	63.4	-0.3
				13996	14214	1.6			
2	1.35	1.40	3.8	15089	14947	-0.9	62.9	63.7	0.8
				14165	14425	1.8			
3	1.33	1.36	2.0	15167	15028	-0.9	63.4	63.9	0.5
				14178	13523	-4.6			
4	1.32	1.42	7.8	15199	15291	0.6	63.3	63.5	0.2
				14188	14225	0.3			
5	1.32	1.41	6.6	15189	15020	-1.1	63.5	63.6	0.1
				14202	13995	-1.5			
6	1.33	1.36	2.6	15148	15269	0.8	63.1	63.5	0.4
				14238	13828	-2.9			
7	1.33	1.40	5.0	15278	15221	-0.4	63.2	63.7	0.5
				14237	14125	-0.8			
8	1.33	1.35	1.3	15321	14854	-3.0	63.4	63.6	0.2
				14223	14447	1.6			
9	1.33	1.39	4.1	15290	14909	-2.5	63.6	63.6	0.0
				14209	14280	0.5			
10	1.32	1.34	1.3	15204	15132	-0.5	63.3	63.5	0.2
				14237	14035	-1.4			
11	1.33	1.35	1.7	15285	15131	-1.0	63.5	63.7	0.2
				14243	13403	-5.9			
12	1.33	1.37	3.1	15344	15050	-1.9	63.7	63.4	-0.3
				14245	14458	1.5			
13	1.33	1.42	6.9	15346	15377	0.2	62.8	63.6	0.8
				14161	14201	0.3			
14	1.32	1.42	7.6	15196	15069	-0.8	63.4	63.7	0.3
				14171	14097	-0.5			
15	1.33	1.34	1.0	15288	15278	-0.1	63.2	63.9	0.7
				14237	14450	1.5			
16	1.31	1.37	4.2	15393	15146	-1.6	63.8	63.4	-0.4
				14240	14126	-0.8			
17	1.33	1.33	-0.2	15350	15302	-0.3	63.5	63.7	0.2
				14229	13695	-3.8			
18	1.32	1.35	2.2	15510	15525	0.1	63.0	63.5	0.5
				14255	14105	-1.1			
QE File No.	Time-out for function test or others (hours)			Issued Date			Reported By		
DG09FNL038	7627.00			2011/12/5			Nan Yang		Tim Yi

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GFB0412GHG-DF00			
GFB0412EHG-DF00			
GFC0412DG-AK1Z			
GFC0412DG-CMA4			

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
2,484	2009/4/11 5:00 PM	2010/6/7 12:07 AM	56	0	15485.0

Representative Test P/N :GFC0412DG-DF00	Current Test Status	☐ In process	☐ In process (exceed requested)	☒ Termination
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Equipment: 1.Oven: E24-T0164	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) 1.96 Max.	Final Test Current Spec. (A) 1.96 Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 13635-16665 12870-15730	Final Test Speed Spec. (RPM) 13635-16665 12870-15730	Deviation (%)	Initial Test Noise Spec. (dB A) 68.4 Max	Final Test Noise Spec. (dB A) 68.4 Max	Deviation
19	1.32	1.38	4.2	15507	15226	-1.8	63.1	63.4	0.3
				14221	14351	0.9			
20	1.33	1.39	4.6	15301	15398	0.6	63.6	63.5	-0.1
				14257	14596	2.4			
21	1.32	1.32	-0.3	15347	15084	-1.7	62.8	63.7	0.9
				14262	14447	1.3			
22	1.40	1.42	1.4	15041	15076	0.2	63.6	63.5	-0.1
				13304	14419	8.4			
23	1.39	1.39	-0.2	15233	15427	1.3	63.4	63.4	0.0
				13426	13389	-0.3			
24	1.37	1.39	1.5	15246	15153	-0.6	63.7	63.5	-0.2
				13509	14167	4.9			
25	1.36	1.43	4.9	15320	15267	-0.3	63.3	63.7	0.4
				13556	14406	6.3			
26	1.35	1.34	-0.7	15315	14867	-2.9	62.8	63.4	0.6
				13762	14303	3.9			
27	1.32	1.41	6.6	15574	14935	-4.1	63.5	63.2	-0.3
				13633	14524	6.5			
28	1.30	1.36	4.6	14365	15497	7.9	63.8	63.5	-0.3
				13773	14565	5.8			
29	1.35	1.39	2.8	15404	15059	-2.2	63.4	63.7	0.3
				13776	14573	5.8			
30	1.39	1.37	-1.3	15314	15427	0.7	63.6	63.4	-0.2
				14073	14414	2.4			
31	1.34	1.40	4.5	15379	15402	0.1	63.3	63.5	0.2
				13852	13925	0.5			
32	1.38	1.35	-2.2	15394	15402	0.1	62.9	63.7	0.8
				14100	14012	-0.6			
33	1.37	1.37	0.1	15407	15270	-0.9	63.4	63.9	0.5
				14133	14414	2.0			
34	1.38	1.35	-2.2	15388	15285	-0.7	63.2	63.5	0.3
				14141	14032	-0.8			
35	1.36	1.40	2.8	15409	15152	-1.7	63.6	63.7	0.1
				14223	14519	2.1			
36	1.38	1.39	0.5	15445	15101	-2.2	63.1	63.9	0.8
				14216	14345	0.9			
37	1.37	1.37	-0.1	15399	15370	-0.2	63.5	63.4	-0.1
				14223	14460	1.7			

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38	1.37	1.35	-1.2	15456	14754	-4.5	63.7	63.5	-0.2
				14288	14329	0.3			
39	1.38	1.35	-2.2	15462	15331	-0.8	63.0	63.7	0.7
				14219	13774	-3.1			
40	1.37	1.39	1.1	15408	15457	0.3	63.1	63.9	0.8
				14216	13622	-4.2			
41	1.38	1.35	-2.5	15482	15103	-2.4	63.6	63.7	0.1
				14202	14267	0.5			
42	1.37	1.38	0.7	15506	15204	-1.9	62.9	63.4	0.5
				14232	14391	1.1			
43	1.37	1.39	1.1	15408	15121	-1.9	63.8	63.5	-0.3
				14207	14477	1.9			
44	1.38	1.34	-3.2	15472	15234	-1.5	63.5	63.7	0.2
				14228	14090	-1.0			
45	1.39	1.40	0.9	15456	14934	-3.4	62.8	63.9	1.1
				14181	14235	0.4			
46	1.39	1.37	-1.6	15495	15507	0.1	63.7	63.6	-0.1
				14227	14371	1.0			
47	1.37	1.37	-0.2	15326	14903	-2.8	63.5	63.7	0.2
				14281	14065	-1.5			
48	1.38	1.38	-0.2	15502	14773	-4.7	63.0	63.9	0.9
				14377	14483	0.7			
49	1.36	1.39	1.9	15590	14887	-4.5	62.8	63.5	0.7
				14250	14015	-1.6			
50	1.36	1.36	-0.1	15555	15238	-2.0	63.4	63.7	0.3
				14368	14173	-1.4			
51	1.37	1.39	1.8	15512	15099	-2.7	63.1	63.6	0.5
				14399	14607	1.4			
52	1.36	1.41	3.9	15462	15789	2.1	63.5	63.5	0.0
				14429	14565	0.9			
53	1.38	1.37	-0.7	15505	15252	-1.6	63.8	63.7	-0.1
				14327	14349	0.2			
54	1.35	1.43	5.6	15527	15432	-0.6	63.0	63.5	0.5
				14414	14290	-0.9			
55	1.36	1.39	2.2	15518	14777	-4.8	63.3	63.7	0.4
				14426	14240	-1.3			
56	1.35	1.28	-5.2	15526	14366	-7.5	62.9	63.6	0.7
				14452	14327	-0.9			
X-Bar	1.353	1.375	-	14743.4	14692.4	-	63.33	63.60	-
σ	0.026	0.030	-	646.946	547.736	-	0.307	0.163	-
QE File No.	Time-out for function test or others (hours)		Issued Date	Reported By		Approved By			
DG09FNL038	7627.00		2011/12/5	Nan Yang		Tim Yi			

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