

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 THD 80X80X80.0 mm series as the right table

Representative Test P/N : THD0812VE-00CWH

Equipment: 1.Oven: E24-F0030

On/Off Cycles: Every 500 hours

© **L₁₀ Expectancy: 70,000 hours minimum @ fan rated voltage and the temperature of 40℃**

According to the equation for **Weibull distribution**, **MTTF $\cong$ 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)
70	40	8.00	30	2.303	6,137	1,360.0	108,583	15,512

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2018/3/23 9:00 AM	2019/3/11 1:14 AM	☒ In process	☐ In process (exceed requested)	☐ Termination	1360.0

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	22.63	307,119	43,874
30	16.00	217,166	31,024
40	8.00	108,583	15,512
50	4.00	54,292	7,756
60	2.00	27,146	3,878
70	1.00	13,573	1,939

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 >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
DG18FNL060	2327.00	2018/8/24	Loly.Wang	Tim Yi

BGN (dBA) : 15.9

Temp (°C) : 22.4

DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

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 THD 80X80X80.0 mm series as the right table

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
6,137	2018/3/23 9:00 AM	2019/3/11 1:14 AM	30	0	1360.0
Representative Test P/N : THD0812VE-00CWH			Current Test Status	☒ In process	☐ In process (exceed requested) ☐ Termination

Equipment: 1.Oven: E24-F0030

On/Off Cycles: Every 500 hours

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) 17.5 Max.	Final Test Current Spec. (A) 17.5 Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 13500-16500 13500-16500	Final Test Speed Spec. (RPM) 13500-16500 13500-16500	Deviation (%)	Initial Test Noise Spec. (dB A) 82.0 Max	Final Test Noise Spec. (dB A) 82.0 Max	Deviation 3 dBMax.
1	14.63	12.90	-11.9	14777	14859	0.6	74.7	76.4	1.7
				14823	14562	-1.8			
2	14.01	12.85	-8.3	14822	14893	0.5	75.2	76.9	1.7
				14798	14746	-0.4			
3	14.76	12.75	-13.6	14822	14884	0.4	76.2	78.1	1.9
				14848	14426	-2.8			
4	14.44	12.99	-10.0	14805	14880	0.5	75.9	77.1	1.2
				14809	14831	0.1			
5	14.38	12.53	-12.9	14785	14774	-0.1	75.8	77.3	1.5
				14844	14843	0.0			
6	14.61	13.86	-5.1	14850	14861	0.1	76.5	77.5	1.0
				14833	14326	-3.4			
7	13.89	13.21	-4.9	14919	14840	-0.5	76.2	78.0	1.8
				14781	14531	-1.7			
8	14.49	12.69	-12.4	14918	14917	0.0	76.6	77.6	1.0
				14790	14841	0.3			
9	14.43	13.05	-9.5	14822	14860	0.3	75.1	76.8	1.7
				14787	14806	0.1			
10	14.62	13.38	-8.4	14888	14888	0.0	75.7	77.1	1.4
				14760	14472	-2.0			
11	14.20	13.50	-4.9	14844	14895	0.3	75.7	77.0	1.3
				14838	14410	-2.9			
12	14.10	13.03	-7.6	14823	14887	0.4	76.2	77.3	1.1
				14849	14844	0.0			
13	14.09	12.83	-9.0	14814	14831	0.1	75.4	77.2	1.8
				14780	14743	-0.3			
14	14.12	13.43	-4.9	14816	14809	0.0	75.7	76.7	1.0
				14852	14472	-2.6			
15	14.12	12.90	-8.6	14837	14920	0.6	75.6	77.9	2.3
				14761	14770	0.1			
16	14.15	13.08	-7.5	14835	14868	0.2	76.6	77.0	0.4
				14854	14859	0.0			
17	14.03	12.80	-8.8	14844	14853	0.1	75.8	76.8	1.0
				14838	14836	0.0			
18	14.23	13.06	-8.2	14829	14861	0.2	75.5	77.7	2.2
				14822	14850	0.2			

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG18FNL060	2327.00	2018/8/24	Loly.Wang	Tim Yi

DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

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 THD 80X80X80.0 mm series as the right table

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 THD 80X80X80.0 mm series as the right table									
Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)				
6,137	2018/3/23 9:00 AM	2019/3/11 1:14 AM	30	0	1360.0				
Representative Test P/N : THD0812VE-00CWH			Current Test Status	☒ In process	☐ In process (exceed requested)	☐ Termination			
Equipment: 1.Oven: E24-F0030				On/Off Cycles: Every 500 hours					
Test Data Between Initial Test and Final Test									
Sample No.	Initial Test Current Spec. (A) 17.5 Max.	Final Test Current Spec. (A) 17.5 Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 13500-16500 13500-16500	Final Test Speed Spec. (RPM) 13500-16500 13500-16500	Deviation (%)	Initial Test Noise Spec. (dB A) 82.0 Max	Final Test Noise Spec. (dB A) 82.0 Max	Deviation 3 dBMax.
19	13.96	13.00	-6.8	14877	14891	0.1	74.6	77.3	2.7
				14831	14859	0.2			
20	15.41	13.36	-13.3	14789	14863	0.5	74.7	76.7	2.0
				14821	14805	-0.1			
21	14.55	13.08	-10.1	14855	14868	0.1	75.1	76.5	1.4
				14810	14834	0.2			
22	13.88	13.08	-5.8	14827	14757	-0.5	76.5	76.6	0.1
				14794	14623	-1.2			
23	14.06	13.64	-3.0	14837	14844	0.0	75.2	77.1	1.9
				14825	14441	-2.6			
24	14.18	13.67	-3.6	14785	14827	0.3	75.3	76.9	1.6
				14811	14413	-2.7			
25	14.72	13.36	-9.2	14798	14896	0.7	75.2	76.6	1.4
				14787	14472	-2.1			
26	14.30	12.96	-9.4	14779	14867	0.6	76.1	77.8	1.7
				14846	14846	0.0			
27	14.14	13.23	-6.5	14779	14769	-0.1	76.2	76.7	0.5
				14838	14838	0.0			
28	14.27	12.67	-11.3	14841	14888	0.3	75.4	76.5	1.1
				14832	14826	0.0			
29	14.45	13.10	-9.4	14811	14849	0.3	75.6	76.8	1.2
				14789	14777	-0.1			
30	14.25	12.88	-9.6	14847	14891	0.3	75.4	76.5	1.1
				14891	14897	0.0			
X-Bar	14.386	4478.918	-	16387.530	14766.885	-	67.721	209.741	-
σ	0.408	13379.617	-	6580.807	157.611	-	23.419	397.640	-
QE File No.	Time-out for function test or others (hours)		Issued Date		Reported By		Approved By		
DG18FNL060	2327.00		2018/8/24		Loly.Wang		Tim Yi		