

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 TCA 100x100x24.8 mm series as the right table	TCA1048AB0C				

Representative Test P/N : TCA1048A-9A24

Equipment: 1.Oven: E24-T0166

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	56	2.303	3,478	7,978.0	1,124,056	160,579

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2010/9/14 2:00 PM	2011/10/31 12:46 PM	☐ In process	☐ In process (exceed requested)	☒ Termination	7978.0

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	3,179,310	454,187
30	16.00	2,248,112	321,159
40	8.00	1,124,056	160,579
50	4.00	562,028	80,290
60	2.00	281,014	40,145
70	1.00	140,507	20,072

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
DG10FNL125	6409.00	2012/5/10	Nan Yang	Wenny.Q

DC FAN FUNCTION TEST RECORD

FOR LIFE EXPERIMENT

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TCA1048AB0C				

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
3,478	2010/9/14 2:00 PM	2011/10/31 12:46 PM	56	0	7978.0

Representative Test P/N : TCA1048A-9A24	Current Test Status	☐ In process	☐ In process (exceed requested)	☒ Termination
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Equipment: 1.Oven: E24-T0166	On/Off Cycles: Every 500 hours
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Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (mA) 470 Max.	Final Test Current Spec. (mA) 470 Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 6030-7370	Final Test Speed Spec. (RPM) 6030-7370	Deviation (%)	Initial Test Noise Spec. (dB A) 69.0 Max	Final Test Noise Spec. (dB A) 69.0 Max	Deviation 3 dBMax.
1	428	375	-12.4	6822	6713	-1.6	66.3	65.4	-0.9
2	424	386	-9.0	6805	6850	0.7	65.7	65.7	0.0
3	427	387	-9.4	6809	6749	-0.9	66.0	65.5	-0.5
4	425	379	-10.8	6786	6758	-0.4	65.9	65.3	-0.6
5	413	374	-9.4	6774	6768	-0.1	66.3	65.6	-0.7
6	432	381	-11.8	6789	6723	-1.0	65.8	65.8	0.0
7	419	387	-7.6	6795	6697	-1.4	66.4	65.4	-1.0
8	425	386	-9.2	6806	6697	-1.6	66.0	65.2	-0.8
9	421	391	-7.1	6794	6729	-1.0	65.8	65.3	-0.5
10	417	392	-6.0	6780	6729	-0.8	66.0	65.7	-0.3
11	415	386	-7.0	6777	6702	-1.1	65.9	65.9	0.0
12	425	380	-10.6	6769	6717	-0.8	66.3	65.2	-1.1
13	424	382	-9.9	6803	6701	-1.5	66.0	65.5	-0.5
14	421	383	-9.0	6786	6690	-1.4	65.7	65.7	0.0
15	429	385	-10.3	6798	6680	-1.7	66.2	65.3	-0.9
16	413	384	-7.0	6769	6703	-1.0	66.1	65.8	-0.3
17	423	383	-9.5	6774	6719	-0.8	65.8	65.1	-0.7
18	423	385	-9.0	6794	6703	-1.3	66.3	65.8	-0.5
19	420	392	-6.7	6817	6718	-1.5	66.0	65.5	-0.5
20	417	396	-5.0	6773	6786	0.2	66.5	65.6	-0.9
21	414	383	-7.5	6784	6707	-1.1	65.8	65.3	-0.5
22	413	375	-9.2	6752	6700	-0.8	65.9	65.8	-0.1
23	414	387	-6.5	6763	6704	-0.9	65.9	65.1	-0.8
24	426	395	-7.3	6795	6711	-1.2	66.2	65.7	-0.5
25	418	381	-8.9	6798	6712	-1.3	65.8	65.6	-0.2
26	419	386	-7.9	6779	6696	-1.2	65.9	65.5	-0.4
27	424	385	-9.2	6798	6790	-0.1	66.1	65.2	-0.9
28	426	382	-10.3	6782	6724	-0.9	66.0	65.8	-0.2
29	421	389	-7.6	6795	6805	0.1	65.8	65.6	-0.2
30	417	385	-7.7	6770	6715	-0.8	66.4	65.3	-1.1
31	422	386	-8.5	6805	6726	-1.2	66.0	65.7	-0.3
32	421	373	-11.4	6797	6647	-2.2	66.3	65.2	-1.1
33	415	387	-6.7	6769	6812	0.6	65.8	65.5	-0.3
34	424	389	-8.3	6790	6691	-1.5	66.3	65.1	-1.2
35	410	388	-5.4	6796	6755	-0.6	65.9	65.6	-0.3

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG10FNL125	6409.00	2012/5/10	Nan Yang	Wenny.Q



DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

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TCA1048AB0C				

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3,478	2010/9/14 2:00 PM	2011/10/31 12:46 PM	56	0	7978.0
Representative Test P/N : TCA1048A-9A24			Current Test Status	☐ In process	☐ In process (exceed requested) ☒ Termination

Equipment: 1.Oven: E24-T0166	On/Off Cycles: Every 500 hours
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Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (mA) 470 Max.	Final Test Current Spec. (mA) 470 Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 6030-7370	Final Test Speed Spec. (RPM) 6030-7370	Deviation (%)	Initial Test Noise Spec. (dB A) 69.0 Max	Final Test Noise Spec. (dB A) 69.0 Max	Deviation 3 dBMax.
36	414	386	-6.8	6788	6725	-0.9	66.1	65.3	-0.8
37	425	395	-7.1	6803	6719	-1.2	65.8	65.4	-0.4
38	428	375	-12.4	6801	6675	-1.9	66.4	65.9	-0.5
39	421	379	-10.0	6787	6712	-1.1	65.9	65.3	-0.6
40	429	386	-10.0	6794	6720	-1.1	66.3	65.1	-1.2
41	420	378	-10.0	6789	6708	-1.2	65.9	65.4	-0.5
42	428	384	-10.3	6801	6686	-1.7	65.7	65.5	-0.2
43	424	385	-9.2	6807	6712	-1.4	66.2	65.8	-0.4
44	419	392	-6.4	6774	6689	-1.3	65.9	65.2	-0.7
45	425	385	-9.4	6791	6718	-1.1	65.8	65.3	-0.5
46	420	380	-9.5	6797	6731	-1.0	66.3	65.7	-0.6
47	420	381	-9.3	6792	6703	-1.3	66.1	65.4	-0.7
48	427	383	-10.3	6806	6713	-1.4	65.8	65.9	0.1
49	427	386	-9.6	6785	6725	-0.9	66.0	65.3	-0.7
50	422	381	-9.7	6790	6710	-1.2	65.7	65.2	-0.5
51	413	387	-6.3	6791	6713	-1.1	65.9	65.7	-0.2
52	427	391	-8.4	6758	6716	-0.6	66.2	65.5	-0.7
53	427	395	-7.5	6815	6823	0.1	66.0	65.8	-0.2
54	424	377	-11.1	6798	6740	-0.9	66.3	65.1	-1.2
55	420	382	-9.0	6766	6730	-0.5	66.1	65.4	-0.7
56	424	386	-9.0	6785	6719	-1.0	66.2	65.6	-0.6
X-Bar	421.6	384.6	-	6789.5	6723.5	-	66.03	65.48	-
σ	5.098	5.412	-	14.902	37.182	-	0.217	0.241	-

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DG10FNL125	6409.00	2012/5/10	Nan Yang	Wenny.Q