



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 THC 172x50.8mm series as the right table				
Representative Test P/N: THC1748MG				
Equipment: 1.Oven: F00-5, E24-T060 2. DC Source: GW GPC-3060D				

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

According to the equation for **Weibull distribution**,

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, **$\beta = 3$**

$$t = L10 \times (B_{r,c}/n)^{1/\beta} / [-\ln(0.9)]^{1/\beta} / AF, \text{ and } AF = 1.5^{(T_s - T_u)/10}$$

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 L10 40°C (hours)
70	40	3.38	56	2.303	15,158	9,763	85,244	45,087

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
15-Nov-13	14-Nov-15	<input checked="" type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input type="checkbox"/> Termination	9,763

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 L10 (hours)
25	6.20	156,603	82,829
30	5.06	127,866	67,630
40	3.38	85,244	45,087
50	2.25	56,829	30,058
60	1.50	37,886	20,038
70	1.00	25,257	13,359

Fan acceptance criteria for the measurements after test :

1. Speed cannot decrease $\geq 15\%$ below the original measured RPM.
2. Current cannot increase $> 15\%$ over original measured current.
3. Noise cannot increase $> 3\text{dB}$ over the original measured noise.

Test Method according to IPC-9591.

Test Result	<input checked="" type="checkbox"/> Accept
	<input type="checkbox"/> Reject

QE File No.	Time-out for function test or others (hours)	Date of issue	Reported By	Approved By
TH13FNL026	1,925	17-Mar-15	Natthichakorn	Niranam



DC FAN FUNCTION TEST RECORD FOR CUSTOMIZED LIFE EXPERIMENT

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Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
15,158	15-Nov-13	14-Nov-15	56	0	9,763
Representative Test P/N: THC1748MG			Current Test Status	<input checked="" type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested) <input type="checkbox"/> Termination
Equipment: 1.Oven: F00-5, E24-T060 2. DC Source: GW GPC-3060D					

Test Data Between Initial Test and Final Test

Sample No.	Initial Test	Final Test	Deviation (%) +15% Max	Initial Test	Final Test	Deviation (%) -15% Max	Initial Test	Final Test	Deviation dB +3 dB Max
	Current Spec. TYP (A) 0.6	Current Spec. TYP (A) 0.6		Speed Spec. REF (RPM) 4100	Speed Spec. REF (RPM) 4100		Noise Spec. Max (dB A) 66.6	Noise Check. Max (dB A) 66.6	
1	0.59	0.63	6.4	4015	4102	2.2	62.8	64.8	2.0
2	0.59	0.59	0.7	4066	4052	-0.3	63.0	65.1	2.1
3	0.62	0.61	-1.5	4021	4099	1.9	62.7	64.7	2.0
4	0.63	0.63	0.6	4083	4108	0.6	62.9	65.1	2.2
5	0.61	0.62	1.4	3992	4105	2.8	62.5	64.6	2.1
6	0.60	0.63	5.7	3987	4097	2.8	62.6	65.0	2.4
7	0.60	0.62	3.7	4056	4144	2.2	62.9	64.4	1.5
8	0.57	0.62	7.7	4004	4122	2.9	62.7	65.2	2.5
9	0.61	0.64	4.6	3973	4107	3.4	62.4	65.2	2.8
10	0.63	0.63	-0.3	4031	4126	2.4	63.0	65.4	2.4
11	0.58	0.60	4.3	3971	4043	1.8	62.8	65.2	2.4
12	0.60	0.60	-0.7	3968	4090	3.1	62.6	64.7	2.1
13	0.63	0.63	0.5	4028	4076	1.2	62.9	65.5	2.6
14	0.61	0.62	2.4	4009	4092	2.1	62.6	65.2	2.6
15	0.59	0.61	3.5	3937	4132	5.0	63.0	64.7	1.7
16	0.63	0.62	-1.9	4020	4099	2.0	62.7	65.2	2.5
17	0.60	0.62	4.4	3984	4106	3.1	62.5	65.4	2.9
18	0.59	0.62	4.1	3962	4125	4.1	62.4	65.4	3.0
19	0.62	0.62	0.8	4043	4095	1.3	63.0	64.3	1.3
20	0.60	0.62	3.4	3957	4091	3.4	62.7	64.8	2.1
21	0.62	0.63	2.2	4026	4118	2.3	62.9	64.9	2.0
22	0.60	0.61	2.4	4013	4138	3.1	62.9	65.0	2.1
23	0.60	0.61	0.9	4038	4087	1.2	63.0	65.2	2.2
24	0.62	0.64	3.8	4001	4153	3.8	62.8	65.1	2.3
25	0.60	0.64	5.3	4039	4167	3.2	62.4	64.6	2.2
26	0.59	0.63	7.1	4004	4128	3.1	62.6	65.0	2.4
27	0.61	0.64	4.7	4030	4125	2.4	62.7	64.7	2.0
28	0.62	0.61	-0.2	4013	4117	2.6	62.9	65.5	2.6
29	0.61	0.64	4.2	4098	4130	0.8	62.9	65.2	2.3
30	0.60	0.63	5.2	3942	4087	3.7	62.5	65.1	2.6
31	0.60	0.59	-1.8	3962	4105	3.6	62.8	65.3	2.5
32	0.60	0.62	3.4	3991	4140	3.7	62.9	64.9	2.0
33	0.62	0.59	-3.7	3994	4107	2.8	62.6	64.7	2.1
34	0.62	0.61	-1.8	4003	4130	3.2	62.9	65.3	2.4
35	0.60	0.59	-1.7	3849	4139	7.5	62.3	64.8	2.5

QE File No.	Time-out for function test or others (hours)	Date of issue	Reported By	Approved By
TH13FNL026	1,925	17-Mar-15	Natthichakorn	Niranam



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	Current Spec. TYP (A) 0.6	Current Spec. TYP (A) 0.6		Speed Spec. REF (RPM) 4100	Speed Spec. REF (RPM) 4100		Noise Spec. Max (dB A) 66.6	Noise Check. Max (dB A) 66.6	
36	0.59	0.63	6.7	3945	4079	3.4	63.0	64.4	1.4
37	0.58	0.65	12.0	3891	4106	5.5	62.4	64.3	1.9
38	0.60	0.60	0.3	4049	4109	1.5	63.0	64.6	1.6
39	0.61	0.62	1.6	4018	4102	2.1	62.7	64.4	1.7
40	0.62	0.59	-3.5	4036	4096	1.5	62.8	64.8	2.0
41	0.59	0.64	8.8	3956	4113	4.0	62.5	65.0	2.5
42	0.60	0.61	2.2	4007	4102	2.4	62.9	65.1	2.2
43	0.61	0.62	1.5	4039	4107	1.7	63.0	65.5	2.5
44	0.61	0.61	0.8	4008	4118	2.7	63.0	65.3	2.3
45	0.59	0.60	2.6	4075	4139	1.6	63.3	64.0	0.7
46	0.61	0.63	4.4	4066	4109	1.1	62.9	64.7	1.8
47	0.62	0.63	1.2	4062	4190	3.2	62.5	64.5	2.0
48	0.61	0.60	-1.8	4058	4096	0.9	62.8	64.9	2.1
49	0.59	0.62	4.3	4050	4136	2.1	63.1	65.2	2.1
50	0.58	0.64	8.9	3980	4101	3.0	62.9	64.8	1.9
51	0.62	0.61	-3.1	3993	4098	2.6	63.0	64.6	1.6
52	0.61	0.61	1.2	3961	4058	2.4	62.7	64.6	1.9
53	0.60	0.64	6.3	4071	4095	0.6	62.3	65.2	2.9
54	0.58	0.64	10.4	3970	4107	3.5	62.5	64.9	2.4
55	0.59	0.61	3.0	3988	4147	4.0	62.7	64.5	1.8
56	0.60	0.62	4.8	3983	4140	3.9	62.5	65.1	2.6
X-bar	0.60	0.62	-	4006	4111	-	62.8	64.9	-
σ	0.01	0.01	-	47	26	-	0.2	0.3	-

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