

DC FAN LIFE EXPERIMENT REPORT

Available for these models with lower speed and same physical structure. All model may be followed byRxx orFxx series suffixes. This test report applies to QFR 80x80x25.4 mm series as the right table	QFR0824UHA01				

Representative Test P/N : QFR0824UHA02

Equipment: 1.Oven: E24-F0058

On/Off Cycles: Every 500 hours

◎ **L₁₀ Expectancy:** **100,000** hours minimum @ fan rated voltage and the temperature of 60℃

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

$$MTTF \cong 7 \times L_{10} = 700,000 \text{ hours}$$

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,

$$t = 1.036 \times MTTF \times [(B_{r,c}) \div n]^{0.91} \div A_F, \text{ and } A_F = 2^{(T_s - T_u)/10}$$

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 60 °C (hours)	Verified L ₁₀ 60 °C (hours)
85	60	5.66	56	2.303	7,026	10,360.0	1,032,140	147,449

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2014/6/10 9:00 AM	2016/1/13 6:40 PM	☐ In process	☐ In process (exceed requested)	☒ Termination	10360.0

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.

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 $> 3\text{dB}$ over the original measure noise.

Temperature for MTTF Estimation (°C)	Acceleration Factor A _F	Estimated MTTF (hours)	Estimated L ₁₀ (hours)
25	64.00	11,677,331	1,668,190
30	45.25	8,257,120	1,179,589
40	22.63	4,128,560	589,794
50	11.31	2,064,280	294,897
60	5.66	1,032,140	147,449
70	2.83	516,070	73,724
85	1.00	182,458	26,065
Test Result		☒ Accept	☐ Reject

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG14FNL065	6951.50	2016/5/27	NaNa.Wang	Tim.Yi

BGN (dBA) :15.8

Temp (°C) : 24.4



DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

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QFR0824UHA01

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
7,026	2014/6/10 9:00 AM	2016/1/13 6:40 PM	56	0	10360.0
Representative Test P/N : QFR0824UHA02			Current Test Status	☐ In process ☐ In process (exceed requested) ☒ Termination	
Equipment: 1.Oven: E24-F0058				On/Off Cycles: Every 500 hours	

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (mA) 440 Max.	Final Test Current Spec. (mA) 440Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 4860-5940	Final Test Speed Spec. (RPM) 4860-5940	Deviation (%)	Initial Test Noise Spec. (dB A) 54.0 Max	Final Test Noise Spec. (dB A) 54.0 Max	Deviation 3 dBMax.
1	229	235	2.6	5507	5555	0.9	50.3	49.8	-0.5
2	234	233	-0.4	5504	5466	-0.7	50.2	49.5	-0.7
3	235	236	0.4	5492	5460	-0.6	50.6	49.1	-1.5
4	232	235	1.3	5475	5553	1.4	50.1	49.8	-0.3
5	232	235	1.3	5465	5503	0.7	50.3	49.6	-0.7
6	240	239	-0.4	5594	5529	-1.2	50.3	49.7	-0.6
7	244	241	-1.2	5544	5612	1.2	51.0	50.3	-0.7
8	230	238	3.5	5468	5531	1.2	50.2	49.5	-0.7
9	235	242	3.0	5468	5527	1.1	50.4	50.5	0.1
10	240	236	-1.7	5546	5502	-0.8	50.7	49.6	-1.1
11	232	235	1.3	5484	5537	1.0	50.9	49.5	-1.4
12	241	234	-2.9	5502	5611	2.0	50.1	49.6	-0.5
13	235	239	1.7	5539	5572	0.6	50.3	50.0	-0.3
14	235	235	0.0	5527	5566	0.7	50.5	49.8	-0.7
15	238	232	-2.5	5502	5594	1.7	50.7	48.9	-1.8
16	234	235	0.4	5504	5565	1.1	50.9	49.7	-1.2
17	232	235	1.3	5464	5562	1.8	50.1	49.6	-0.5
18	233	242	3.9	5450	5605	2.8	50.3	48.9	-1.4
19	235	236	0.4	5578	5483	-1.7	50.5	49.6	-0.9
20	234	233	-0.4	5476	5637	2.9	50.7	49.3	-1.4
21	231	238	3.0	5490	5476	-0.3	50.9	49.5	-1.4
22	236	240	1.7	5498	5547	0.9	50.1	50.2	0.1
23	234	232	-0.9	5430	5520	1.7	50.3	49.2	-1.1
24	235	233	-0.9	5449	5525	1.4	50.5	48.5	-2.0
25	244	234	-4.1	5540	5435	-1.9	50.7	49.2	-1.5
26	240	236	-1.7	5556	5521	-0.6	50.9	49.5	-1.4
27	244	244	0.0	5512	5532	0.4	50.2	49.8	-0.4
28	231	235	1.7	5491	5466	-0.5	50.1	49.7	-0.4
29	228	235	3.1	5459	5517	1.1	50.4	50.2	-0.2
30	237	235	-0.8	5501	5635	2.4	50.7	49.2	-1.5
31	229	230	0.4	5442	5500	1.1	50.5	48.9	-1.6
32	234	238	1.7	5544	5612	1.2	50.8	49.0	-1.8

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG14FNL065	6951.50	2016/5/27	NaNa.Wang	Tim.Yi



DC FAN FUNCTION TEST RECORD FOR 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)				
7,026	2014/6/10 9:00 AM	2016/1/13 6:40 PM	56	0	10360.0				
Representative Test P/N : QFR0824UHA02			Current Test Status	☐ In process	☐ In process (exceed requested)	☒ Termination			
Equipment: 1.Oven: E24-F0058				On/Off Cycles: Every 500 hours					
Test Data Between Initial Test and Final Test									
Sample No.	Initial Test Current Spec. (mA) 440 Max.	Final Test Current Spec. (mA) 440Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 4860-5940	Final Test Speed Spec. (RPM) 4860-5940	Deviation (%)	Initial Test Noise Spec. (dB A) 54.0 Max	Final Test Noise Spec. (dB A) 54.0 Max	Deviation 3 dBMax.
33	234	241	3.0	5499	5532	0.6	50.9	50.2	-0.7
34	228	239	4.8	5413	5522	2.0	50.1	49.6	-0.5
35	238	243	2.1	5556	5544	-0.2	50.3	49.4	-0.9
36	231	236	2.2	5528	5627	1.8	50.5	49.3	-1.2
37	233	243	4.3	5534	5565	0.6	50.6	49.9	-0.7
38	220	233	5.9	5482	5636	2.8	50.8	49.1	-1.7
39	232	231	-0.4	5518	5498	-0.4	51.0	49.5	-1.5
40	240	232	-3.3	5534	5575	0.7	50.2	49.3	-0.9
41	234	238	1.7	5537	5522	-0.3	50.4	49.2	-1.2
42	229	238	3.9	5484	5496	0.2	50.6	49.7	-0.9
43	237	237	0.0	5481	5555	1.4	50.8	49.4	-1.4
44	233	234	0.4	5552	5515	-0.7	51.0	49.6	-1.4
45	234	238	1.7	5452	5630	3.3	50.2	48.9	-1.3
46	231	236	2.2	5473	5590	2.1	50.4	50.4	0.0
47	242	237	-2.1	5611	5646	0.6	50.6	51.4	0.8
48	240	239	-0.4	5577	5611	0.6	50.8	50.1	-0.7
49	237	233	-1.7	5504	5588	1.5	51.0	49.6	-1.4
50	231	241	4.3	5507	5565	1.1	50.2	49.4	-0.8
51	242	238	-1.7	5572	5546	-0.5	50.4	49.9	-0.5
52	240	236	-1.7	5512	5510	0.0	50.6	48.7	-1.9
53	228	236	3.5	5489	5570	1.5	50.8	49.0	-1.8
54	234	235	0.4	5533	5499	-0.6	51.0	48.7	-2.3
55	231	207	-10.4	5469	5003	-8.5	50.3	49.0	-1.3
56	230	238	3.5	5467	5545	1.4	50.5	48.8	-1.7
X-Bar	234.5	236.0	-	5505.1	5538.3	-	50.52	49.5	-
σ	4.741	5.069	-	42.012	88.606	-	0.289	0.519	-
QE File No.	Time-out for function test or others (hrs)		Issued Date		Reported By		Approved By		
DG14FNL065	6951.50		2016/5/27		NaNa.Wang		Tim.Yi		