



# 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 QFR120x120x38.0 mm series as the right table

**Representative Test P/N : QFR1248GHE-SP01**

**Equipment: 1. Oven : E24-T0159**

On/Off Cycles: Every 500 hours

◎ **L<sub>10</sub> Expectancy: 50,000 hours minimum @ fan rated voltage and the temperature of 40°C**

According to the equation for **Weibull distribution**, **MTTF ≐ 7×L<sub>10</sub> = 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<sub>r,c</sub>) 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 Ts (°C) ( Actual Test Temperature )	Unstress Temperature Tu (°C)	Acceleration Factor A <sub>F</sub>	Quantity of Test Devices n (pcs)	Poisson Distribution Factor B <sub>r,c</sub>	Required test time with zero failure t (hours)	Actual test time with zero failure t (hours)	Verified MTTF 40 °C (hours)	Verified L <sub>10</sub> 40 °C (hours)
60	40	4.00	56	2.303	4,968	15,360.0	1,082,069	154,581

## Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2007/7/5 2:00 PM	2008/12/3 7:15 AM	<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input checked="" type="checkbox"/> Termination	15360.0

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' L<sub>10</sub> 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 <sub>F</sub>	Estimated MTTF (hours)	Estimated L <sub>10</sub> (hours)
25	11.31	3,060,554	437,222
30	8.00	2,164,139	309,163
40	4.00	1,082,069	154,581
50	2.00	541,035	77,291
60	1.00	270,517	38,645

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.

**Test Result**

- Accept**  
 **Reject**

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG07FNL136	7433.00	2010/2/12	Nan Yang	Zenny Lei



# 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 to QFR120x120x38.0 mm series as the right table

<b>Required Test Time (hrs)</b>	<b>Date for Test Beginning</b>	<b>Date for Test Termination</b>	<b>Sample Size (pcs):</b>	<b>Failure (pcs):</b>	<b>Current Total Test Time (hrs)</b>
4,968	2007/7/5 2:00 PM	2008/12/3 7:15 AM	56	0	<b>15360.0</b>

<b>Representative Test P/N : QFR1248GHE-SP01</b>	<b>Current Test Status</b>	<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input checked="" type="checkbox"/> Termination
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Equipment: 1. Oven : E24-T0159 On/Off Cycles: Every 500 hours

### Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (mA)	Final Test Current Spec. (mA)	Deviation (%)	Initial Test Speed Spec. (RPM)	Final Test Speed Spec. (RPM)	Deviation (%)	Initial Test Noise Spec. (dB A)	Final Test Noise Spec. (dB A)	Deviation 3 dB Max.
	<b>750Max.</b>	<b>750Max.</b>		<b>5400-6600</b>	<b>5400-6600</b>		<b>68.0Max</b>	<b>68.0Max</b>	
1	457	457	0.0	5859	5769	-1.5	63.4	63.9	0.5
2	450	476	5.8	5829	5868	0.7	63.9	64.4	0.5
3	471	480	1.9	5834	5898	1.1	63.7	64.0	0.3
4	464	466	0.4	5757	5795	0.7	64.2	64.7	0.5
5	464	475	2.4	5913	5906	-0.1	63.8	64.1	0.3
6	464	466	0.4	5933	5833	-1.7	63.4	64.3	0.9
7	453	483	6.6	5928	5808	-2.0	63.7	63.9	0.2
8	443	471	6.3	5802	5871	1.2	63.3	64.5	1.2
9	468	463	-1.1	5865	5756	-1.9	64.0	64.9	0.9
10	476	460	-3.4	5919	5758	-2.7	63.9	64.1	0.2
11	464	475	2.4	5863	5908	0.8	63.5	64.6	1.1
12	476	454	-4.6	5903	5779	-2.1	63.8	64.0	0.2
13	463	461	-0.4	5896	5796	-1.7	63.2	63.6	0.4
14	461	480	4.1	5930	5808	-2.1	63.7	64.2	0.5
15	450	454	0.9	5781	5741	-0.7	64.1	64.5	0.4
16	445	464	4.3	5783	5750	-0.6	63.5	63.9	0.4
17	459	456	-0.7	5861	5777	-1.4	63.9	64.4	0.5
18	462	476	3.0	5871	5868	-0.1	63.4	64.0	0.6
19	445	451	1.3	5816	5765	-0.9	63.8	64.7	0.9
20	456	475	4.2	5906	5870	-0.6	63.7	64.2	0.5
21	442	458	3.6	5777	5744	-0.6	64.0	64.2	0.2
22	466	466	0.0	5902	5833	-1.2	63.7	64.8	1.1
23	453	477	5.3	5895	5832	-1.1	63.5	64.3	0.8
24	467	465	-0.4	5884	5827	-1.0	63.9	64.5	0.6
25	446	481	7.8	5835	5896	1.0	64.2	64.1	-0.1
26	471	465	-1.3	5916	5817	-1.7	63.6	64.4	0.8
27	447	466	4.3	5822	5808	-0.2	63.8	63.9	0.1
28	461	464	0.7	5896	5759	-2.3	64.0	64.2	0.2
29	459	475	3.5	5886	5825	-1.0	63.6	64.1	0.5
30	581	518	-10.8	5845	5902	1.0	63.9	63.9	0.0
31	462	456	-1.3	5816	5769	-0.8	64.0	64.4	0.4
32	452	465	2.9	5734	5819	1.5	63.5	64.8	1.3
33	463	463	0.0	5856	5827	-0.5	63.8	64.2	0.4
34	445	455	2.2	5775	5759	-0.3	64.2	63.9	-0.3
35	448	456	1.8	5911	5762	-2.5	63.5	64.4	0.9

<b>QE File No.</b>	<b>Time-out for function test or others (hours)</b>	<b>Issued Date</b>	<b>Reported By</b>	<b>Approved By</b>
<b>DG07FNL136</b>	<b>7433.00</b>	<b>2010/2/12</b>	<b>Nan Yang</b>	<b>Zenny Lei</b>



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4,968	2007/7/5 2:00 PM	2008/12/3 7:15 AM	56	0	<b>15360.0</b>
Representative Test P/N : QFR1248GHE-SP01			<b>Current Test Status</b>	<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested) <input checked="" type="checkbox"/> Termination
Equipment: 1. Oven : E24-T0159				On/Off Cycles: Every 500 hours	

### Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (mA) <b>750Max.</b>	Final Test Current Spec. (mA) <b>750Max.</b>	Deviation (%)	Initial Test Speed Spec. (RPM) <b>5400-6600</b>	Final Test Speed Spec. (RPM) <b>5400-6600</b>	Deviation (%)	Initial Test Noise Spec. (dB A) <b>68.0Max</b>	Final Test Noise Spec. (dB A) <b>68.0Max</b>	Deviation <b>3 dB Max.</b>
36	489	461	-5.7	5888	5796	-1.6	63.9	64.3	0.4
37	452	480	6.2	5841	5808	-0.6	63.5	64.5	1.0
38	474	467	-1.5	5850	5796	-0.9	63.8	64.0	0.2
39	451	463	2.7	5915	5775	-2.4	64.1	64.6	0.5
40	468	464	-0.9	5847	5750	-1.7	63.5	64.1	0.6
41	448	463	3.3	5757	5770	0.2	63.9	64.7	0.8
42	451	450	-0.2	5789	5767	-0.4	63.7	64.3	0.6
43	468	475	1.5	5832	5870	0.7	64.0	64.5	0.5
44	473	477	0.8	5751	5832	1.4	63.9	64.1	0.2
45	467	475	1.7	5844	5825	-0.3	63.5	64.4	0.9
46	466	474	1.7	5768	5897	2.2	63.8	64.2	0.4
47	476	457	-4.0	5881	5769	-1.9	64.0	64.4	0.4
48	463	456	-1.5	5750	5784	0.6	63.7	63.9	0.2
49	464	459	-1.1	5909	5764	-2.5	63.9	64.2	0.3
50	469	476	1.5	5734	5875	2.5	63.5	64.1	0.6
51	478	453	-5.2	5905	5764	-2.4	63.8	64.4	0.6
52	454	460	1.3	5833	5798	-0.6	64.2	64.6	0.4
53	456	463	1.5	5942	5827	-1.9	63.9	64.5	0.6
54	453	475	4.9	5852	5718	-2.3	63.5	64.1	0.6
55	467	463	-0.9	5838	5770	-1.2	63.8	64.2	0.4
56	456	476	4.4	5814	5875	1.0	64.1	64.5	0.4
X-Bar	462.4	467.1	-	5848.9	5809.5	-	63.77	64.28	-
$\sigma$	19.130	11.247	-	57.102	50.223	-	0.246	0.280	-

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DG07FNL136	7433.00	2010/2/12	Nan Yang	Zenny Lei