DELTA ELECTRONICS, INC.

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 120x120x38.0 mm** series as the right table	QFR1224GHE-SP01				
	QFR1248GHE	QFR1248EHE			
	QFR1224GHE	QFR1224EHE			
Representative Test P/N : QFR1248DE-F00					
Equipment: 1.Oven: E24-F0119			On/Off Cycles: Every 500 hours		

◎ **L_{10} Expectancy: 50,000 hours minimum @ fan rated voltage and the temperature of 40℃**

According to the equation for **Weibull distribution**, **MTTF ≒ 7×L10 = 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,

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

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 Ts (℃)	Unstress Temperature Tu (℃)	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 ℃ (hours)	Verified L_{10} 40 ℃ (hours)
60	40	4.00	56	2.303	4,968	9,360.0	659,386	94,198

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2006/6/22 5:00 PM	2008/2/17 6:15 PM	☐ In process	☐ In process (exceed requested)	☑ Termination	9360.0

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_{10} 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 (℃)	Acceleration Factor A_F	Estimated MTTF (hours)	Estimated L_{10} (hours)
25	11.31	1,865,025	266,432
30	8.00	1,318,772	188,396
40	4.00	659,386	94,198
50	2.00	329,693	47,099
60	1.00	164,846	23,549

Fan permission criteria for the measurement after test :
1. Speed can not drop of ≧ 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
DG06FNL129	9553.00	2008/8/18	Nan Yang	Zenny Lei

DELTA ELECTRONICS, INC.

DC FAN FUNCTION TEST RECORD
FOR CUSTOMIZED LIFE EXPERIMENT

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QFR1224GHE-SP01				
QFR1248GHE	QFR1248EHE			
QFR1224GHE	QFR1224EHE			

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
4,968	2006/6/22 5:00 PM	2008/2/17 6:15 PM	56	0	**9360.0**

Representative Test P/N : QFR1248DE-F00	Current Test Status	☐ In process	☐ In process (exceed requested)	☑ Termination

Equipment: 1.Oven: E24-F0119 — On/Off Cycles: Every 500 hours

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (mA) 750 TYP	Final Test Current Spec. (mA) 750TYP	Deviation (%) **15% Max**	Initial Test Speed Spec. (RPM) 6000REF	Final Test Speed Spec. (RPM) 6000REF	Deviation (%) **15% Max**	Initial Test Noise Spec. (dB A) 68.0Max	Final Test Noise Check. (dB A) 68.0Max	Deviation (%) **3 dB Max**
1	479	488	1.9	5814	5835	0.4	64.0	64.8	0.8
2	476	487	2.3	5865	5598	-4.6	64.1	64.9	0.8
3	481	489	1.7	5894	5975	1.4	64.3	64.5	0.2
4	462	488	5.6	5879	5784	-1.6	64.0	64.7	0.7
5	459	497	8.3	5928	5890	-0.6	63.8	64.7	0.9
6	440	482	9.5	5914	5738	-3.0	64.2	64.9	0.7
7	482	477	-1.0	5895	5809	-1.5	64.5	64.8	0.3
8	479	490	2.3	5876	5872	-0.1	64.1	64.5	0.4
9	489	481	-1.6	5836	5825	-0.2	64.3	64.4	0.1
10	462	478	3.5	5846	5915	1.2	64.2	64.5	0.3
11	475	486	2.3	5821	5865	0.8	64.4	64.3	-0.1
12	474	478	0.8	5832	5791	-0.7	64.0	64.7	0.7
13	483	489	1.2	5846	5902	1.0	64.2	64.5	0.3
14	488	473	-3.1	5882	5835	-0.8	64.1	64.3	0.2
15	465	476	2.4	5868	5808	-1.0	64.4	64.8	0.4
16	462	485	5.0	5902	5914	0.2	64.2	64.9	0.7
17	467	490	4.9	5865	5879	0.2	64.1	64.7	0.6
18	452	479	6.0	5721	5790	1.2	64.3	64.1	-0.2
19	485	490	1.0	5865	5907	0.7	64.0	64.0	0.0
20	470	474	0.9	5891	5821	-1.2	64.2	64.3	0.1
21	472	481	1.9	5795	5813	0.3	64.3	64.8	0.5
22	488	497	1.8	5812	5892	1.4	64.0	64.7	0.7
23	481	502	4.4	5768	5827	1.0	64.4	64.9	0.5
24	479	476	-0.6	5895	5835	-1.0	64.2	64.8	0.6
25	462	495	7.1	5765	5873	1.9	64.1	64.4	0.3
26	471	478	1.5	5835	5754	-1.4	64.3	64.7	0.4
27	452	490	8.4	5921	5861	-1.0	64.0	64.9	0.9
28	492	483	-1.8	5865	5744	-2.1	64.1	64.1	0.0
29	472	481	1.9	5802	5764	-0.7	64.2	64.3	0.1
30	477	487	2.1	5834	5899	1.1	64.5	64.7	0.2
31	481	485	0.8	5895	5877	-0.3	64.3	64.3	0.0
32	460	481	4.6	5921	5779	-2.4	64.0	64.9	0.9
33	498	484	-2.8	5835	5915	1.4	64.2	64.5	0.3
34	479	479	0.0	5869	5779	-1.5	64.4	64.5	0.1
35	461	482	4.6	5810	5842	0.6	64.0	64.3	0.3

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG06FNL129	**9553.00**	**2008/8/18**	**Nan.Yang**	**Zenny Lei**

DELTA ELECTRONICS, INC.

DC FAN FUNCTION TEST RECORD
FOR CUSTOMIZED LIFE EXPERIMENT

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	QFR1248GHE	QFR1248EHE			
	QFR1224GHE	QFR1224EHE			

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
4,968	2006/6/22 5:00 PM	2008/2/17 6:15 PM	56	0	**9360.0**

Representative Test P/N : QFR1248DE-F00	Current Test Status	☐ In process	☐ In process (exceed requested)	☑ Termination
Equipment: 1.Oven: E24-F0119		On/Off Cycles: Every 500 hours		

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (mA) 750 TYP	Final Test Current Spec. (mA) 750TYP	Deviation (%) **15% Max**	Initial Test Speed Spec. (RPM) 6000REF	Final Test Speed Spec. (RPM) 6000REF	Deviation (%) **15% Max**	Initial Test Noise Spec. (dB A) 68.0Max	Final Test Noise Check. (dB A) 68.0Max	Deviation (%) **3 dB Max**
36	459	474	3.3	5862	5916	0.9	64.1	64.9	0.8
37	451	479	6.2	5932	5821	-1.9	64.3	64.9	0.6
38	478	471	-1.5	5875	5890	0.3	64.5	64.2	-0.3
39	481	469	-2.5	5901	5929	0.5	64.2	64.8	0.6
40	486	479	-1.4	5864	5809	-0.9	64.4	64.4	0.0
41	482	469	-2.7	5874	5923	0.8	64.0	64.7	0.7
42	455	475	4.4	5816	5834	0.3	64.3	64.2	-0.1
43	495	473	-4.4	5984	5791	-3.2	64.2	64.5	0.3
44	489	473	-3.3	5891	5912	0.4	64.4	64.3	-0.1
45	471	474	0.6	5924	5819	-1.8	64.0	64.9	0.9
46	482	471	-2.3	5834	5890	1.0	64.3	64.5	0.2
47	476	490	2.9	5867	5877	0.2	64.1	64.8	0.7
48	475	481	1.3	5845	5864	0.3	64.4	64.5	0.1
49	478	478	0.0	5865	5674	-3.3	64.3	64.9	0.6
50	461	486	5.4	5874	5647	-3.9	64.2	64.2	0.0
51	462	478	3.5	5921	5987	1.1	64.0	64.4	0.4
52	459	489	6.5	5942	5584	-6.0	64.3	64.4	0.1
53	456	473	3.7	5922	5864	-1.0	64.4	64.8	0.4
54	479	476	-0.6	5901	5687	-3.6	64.2	64.2	0.0
55	472	485	2.8	5865	5897	0.5	64.0	64.5	0.5
56	468	490	4.7	5878	5994	2.0	64.3	64.3	0.0
X-Bar	472.7	482.0	-	5866.1	5836.0	-	64.20	64.56	-
σ	12.413	7.550	-	47.771	86.059	-	0.161	0.261	-

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DG06FNL129	**9553.00**	**2008/8/18**	**Nan.Yang**	**Zenny Lei**