DELTA ELECTRONICS, INC.

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 **GFM 40x40x56.0 mm** series as the right table	GFM0412SS-DE1PB7Q				
Representative Test P/N :GFM0412SS-CA01					
Equipment: 1.Oven: E24-T0174			On/Off Cycles: Every 500 hours		

◎ **L_{10} Expectancy: 30,000 hours minimum @ fan rated voltage and the temperature of 55℃**

According to the equation for **Weibull distribution**, **MTTF ≒ 7×L10 = 210,000 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 (℃) (Actual Test Temperature)	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 55 ℃ (hours)	Verified L_{10} 55 ℃ (hours)
70	**55**	**2.83**	**56**	**2.303**	**4,216**	**6,360.0**	**316,815**	**45,259**

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2015/2/2 3:30 PM	2015/12/19 10:42 AM	☐ In process	☑ In process (exceed requested)	☐ Termination	**6360.0**

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	**22.63**	**2,534,521**	**362,074**
30	**16.00**	**1,792,177**	**256,025**
40	**8.00**	**896,089**	**128,013**
50	**4.00**	**448,044**	**64,006**
60	**2.00**	**224,022**	**32,003**
70	**1.00**	**112,011**	**16,002**

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
DG15FNL012	**3459.50**	**2016/4/16**	**NaNa.Wang**	**Tim Yi**

BGN（dBA）:16.0 Temp（℃）：23.9

DELTA ELECTRONICS, INC.

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 GFM 40x40x56.0 mm series as the right table	GFM0412SS-DE1PB7Q				

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
4,216	2015/2/2 3:30 PM	2015/12/19 10:42 AM	56	0	**6360.0**

Representative Test P/N :GFM0412SS-CA01	**Current Test Status**	☐ In process	☑ In process (exceed requested)	☐ Termination
Equipment: 1.Oven: E24-T0174		On/Off Cycles: Every 500 hours		

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) **1.40Max.**	Final Test Current Spec. (A) **1.40Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **18288-20213** / **18050-19950**	Final Test Speed Spec. (RPM) **18288-20213** / **18050-19950**	Deviation (%)	Initial Test Noise Spec. (dB A) **72.5 Max**	Final Test Noise Spec. (dB A) **72.5 Max**	Deviation **3 dBMax.**
1	1. 21	1. 05	-13.5	19137	18854	-1.5	63.8	66.1	2.3
				18996	18702	-1.5			
2	1. 22	1. 21	-0.7	19188	18690	-2.6	64.2	66.1	1.9
				18884	18644	-1.3			
3	1. 20	1. 03	-14.1	19192	18894	-1.6	64.1	66.3	2.2
				19088	18678	-2.1			
4	1. 13	1. 06	-5.9	19363	19069	-1.5	64.0	66.5	2.5
				18989	18603	-2.0			
5	1. 21	1. 23	1.2	19178	18782	-2.1	64.2	66.1	1.9
				18828	18864	0.2			
6	1. 28	1. 29	1.0	19105	19051	-0.3	65.8	67.5	1.7
				18807	18780	-0.1			
7	1. 19	1. 05	-12.0	19115	19004	-0.6	64.5	67.3	2.8
				19106	18726	-2.0			
8	1. 20	1. 06	-11.6	19138	18995	-0.7	65.2	67.1	1.9
				19305	18723	-3.0			
9	1. 22	1. 05	-13.7	19009	18837	-0.9	64.7	66.5	1.8
				18781	18747	-0.2			
10	1. 20	1. 04	-13.7	19238	18683	-2.9	64.9	66.5	1.6
				19102	18727	-2.0			
11	1. 17	1. 05	-9.5	19157	18849	-1.6	65.5	66.0	0.5
				19061	18502	-2.9			
12	1. 21	1. 06	-12.8	18918	18928	0.1	65.7	66.1	0.4
				18806	18563	-1.3			
13	1. 19	1. 04	-12.7	19131	18842	-1.5	64.1	66.1	2.0
				18890	18592	-1.6			
14	1. 13	1. 01	-10.5	19031	18890	-0.7	63.9	66.6	2.7
				18979	18658	-1.7			
15	1. 15	1. 07	-6.9	19057	18874	-1.0	64.2	66.9	2.7
				18924	18835	-0.5			
16	1. 19	1. 06	-10.9	18975	18972	0.0	65.0	67.0	2.0
				19127	18802	-1.7			
17	1. 25	1. 23	-1.4	19007	18837	-0.9	65.2	66.9	1.7
				18893	18674	-1.2			
18	1. 21	1. 06	-12.2	19150	18855	-1.5	64.5	65.5	1.0
				19085	18592	-2.6			

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG15FNL012	**3459.50**	**2016/4/16**	**NaNa.Wang**	**Tim Yi**

DC FAN FUNCTION TEST RECORD
FOR LIFE EXPERIMENT

DELTA ELECTRONICS, INC.

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 GFM 40x40x56.0 mm series as the right table	GFM0412SS-DE1PB7Q				

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
4,216	2015/2/2 3:30 PM	2015/12/19 10:42 AM	56	0	**6360.0**

Representative Test P/N :GFM0412SS-CA01	**Current Test Status**	☐ In process	☑ In process (exceed requested)	☐ Termination
Equipment: 1.Oven: E24-T0174		On/Off Cycles: Every 500 hours		

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) **1.40Max.**	Final Test Current Spec. (A) **1.40Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **18288-20213 18050-19950**	Final Test Speed Spec. (RPM) **18288-20213 18050-19950**	Deviation (%)	Initial Test Noise Spec. (dB A) **72.5 Max**	Final Test Noise Spec. (dB A) **72.5 Max**	Deviation **3 dBMax.**
19	1. 17	1. 03	-11.8	19257	18773	-2.5	64.7	66.2	1.5
				18881	18821	-0.3			
20	1. 20	1. 07	-11.2	18934	19048	0.6	65.4	66.8	1.4
				19089	18945	-0.8			
21	1. 13	1. 01	-10.4	18974	18754	-1.2	65.6	66.3	0.7
				18954	18508	-2.4			
22	1. 25	1. 26	1.0	19036	19005	-0.2	64.9	66.7	1.8
				18998	18560	-2.3			
23	1. 24	1. 25	0.8	19218	19060	-0.8	65.8	66.5	0.7
				18988	18708	-1.5			
24	1. 18	1. 05	-10.9	19085	18965	-0.6	64.1	65.8	1.7
				18899	18541	-1.9			
25	1. 15	1. 01	-12.2	19074	18871	-1.1	64.3	67.2	2.9
				18854	18689	-0.9			
26	1. 18	1. 06	-10.1	18994	18709	-1.5	65.2	65.9	0.7
				19068	18676	-2.1			
27	1. 24	1. 09	-12.1	19221	19044	-0.9	65.4	66.3	0.9
				18951	18640	-1.6			
28	1. 18	1. 06	-9.6	19204	19034	-0.9	64.6	66.8	2.2
				18903	18539	-1.9			
29	1. 24	1. 25	0.6	19084	18746	-1.8	64.3	66.1	1.8
				19097	18693	-2.1			
30	1. 24	1. 25	0.6	19199	18954	-1.3	64.5	66.0	1.5
				18964	18757	-1.1			
31	1. 19	1. 10	-7.7	19364	18942	-2.2	65.0	65.7	0.7
				19152	18938	-1.1			
32	1. 18	1. 05	-11.1	19345	18911	-2.2	65.2	66.7	1.5
				19012	18762	-1.3			
33	1. 15	1. 09	-5.7	19054	19020	-0.2	64.4	66.8	2.4
				18929	18630	-1.6			
34	1. 20	1. 08	-10.1	19052	19123	0.4	65.1	66.5	1.4
				19047	18589	-2.4			
35	1. 17	1. 07	-8.3	19219	18888	-1.7	64.6	66.4	1.8
				19078	18811	-1.4			
36	1. 10	1. 05	-4.6	19080	18967	-0.6	65.3	66.8	1.5
				19118	18609	-2.7			
37	1. 15	1. 04	-10.1	19096	18885	-1.1	64.8	65.2	0.4
				18897	18471	-2.3			

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG15FNL012	**3459.50**	**2016/4/16**	**NaNa.Wang**	**Tim Yi**

DELTA ELECTRONICS, INC.

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 GFM 40x40x56.0 mm series as the right table	GFM0412SS-DE1PB7Q				

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
4,216	2015/2/2 3:30 PM	2015/12/19 10:42 AM	56	0	**6360.0**

Representative Test P/N :GFM0412SS-CA01	**Current Test Status**	☐ In process	☑ In process (exceed requested)	☐ Termination
Equipment: 1.Oven: E24-T0174		On/Off Cycles: Every 500 hours		

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) **1.40Max.**	Final Test Current Spec. (A) **1.40Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **18288-20213 18050-19950**	Final Test Speed Spec. (RPM) **18288-20213 18050-19950**	Deviation (%)	Initial Test Noise Spec. (dB A) **72.5 Max**	Final Test Noise Spec. (dB A) **72.5 Max**	Deviation **3 dBMax.**
38	1. 12	1. 05	-6.1	19050	18832	-1.1	65.4	66.0	0.6
				18864	18866	0.0			
39	1. 21	1. 05	-13.3	19187	18832	-1.9	65.6	66.4	0.8
				18958	18833	-0.7			
40	1. 15	1. 04	-9.3	19095	18835	-1.4	64.0	66.7	2.7
				18967	18743	-1.2			
41	1. 19	1. 04	-12.5	18970	18861	-0.6	65.8	66.7	0.9
				18934	18887	-0.2			
42	1. 17	1. 07	-8.8	19083	18892	-1.0	63.8	66.6	2.8
				18770	18877	0.6			
43	1. 20	1. 05	-12.4	18927	19028	0.5	64.3	66.9	2.6
				18780	18870	0.5			
44	1. 15	1. 03	-11.1	19269	18868	-2.1	65.1	66.7	1.6
				19196	18583	-3.2			
45	1. 19	1. 09	-7.8	18963	18907	-0.3	64.4	66.7	2.3
				18991	18749	-1.3			
46	1. 25	1. 26	0.3	19123	18928	-1.0	64.6	64.6	0.0
				19121	18704	-2.2			
47	1. 15	1. 03	-10.3	18978	18721	-1.4	65.3	64.6	-0.7
				18799	18823	0.1			
48	1. 15	1. 07	-7.7	19016	19075	0.3	65.5	66.5	1.0
				18744	18789	0.2			
49	1. 15	1. 08	-6.5	19150	18952	-1.0	64.8	66.2	1.4
				18894	18790	-0.6			
50	1. 17	1. 06	-9.0	19089	18891	-1.0	65.7	67.3	1.6
				19064	18660	-2.1			
51	1. 11	1. 04	-6.3	19031	18907	-0.7	64.0	65.9	1.9
				18750	18610	-0.7			
52	1. 27	1. 23	-3.1	19056	18751	-1.6	64.2	66.0	1.8
				18933	18858	-0.4			
53	1. 16	1. 06	-9.2	19089	18861	-1.2	65.1	66.6	1.5
				18857	18584	-1.4			
54	1. 28	1. 26	-1.9	19038	19017	-0.1	65.3	65.9	0.6
				18831	18831	0.0			
55	1. 19	1. 06	-10.9	19033	18782	-1.3	64.5	66.2	1.7
				18972	18745	-1.2			
56	1. 15	1. 07	-6.8	19004	18867	-0.7	64.9	66.9	2.0
				18955	18884	-0.4			
X-Bar	15.343	1.091	-	19032.5	18807.116	-	64.80	66.379	-
σ	18.276	0.080	-	134.444	146.432	-	0.587	0.577	-

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG15FNL012	**3459.50**	**2016/4/16**	**NaNa.Wang**	**Tim Yi**