Ref. No.	ZBG2212D(BG)0101-000526-06(E)
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PREDICTION REPORT

Product Name: Silicone Keyboard

Type and Specification: K-TEK-M275TP-FN-BL-NV-EMC-151B

Test Category: Entrusted Prediction

Factory: Key Technology （China） Limited

Client: Key Technology （China） Limited

CEPREI

CHINA CEPREI LABORATORY

The 5th Electronic Institute of MIIT

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Address: No. 78, West of Zhucun Road, Zengcheng District, Guangzhou, Guangdong, China
Post Code: 511370
TEL: +86-020-87236314, +86-20-85131181（for business contact）
FAX: +86-20-87237620
Complaint： +86-20-87237948，+86-20-87236881

1. Prediction Purpose

By conducting reliability prediction for K-TEK-M275TP-FN-BL-NV-EMC-151B silicone keyboard produced by Key Technology （China） Limited, the product reliability prediction result is obtained under the typical service environment.

2. Prediction Basis

GJB/Z 299C-2006 Reliability Prediction Manual For Electronic Equipment

3. Prediction Method Description

Considering the silicone keyboard detained design is finished, the specification, quantity, service stress and environment of each component of the prototype is determined. Therefore, the component stress analysis method is employed to conduct reliability prediction.

The components failure rate model is according to the corresponding categories in GJB/Z 299C-2006.

4. Product State Description

The silicone keyboard appearance is as Fig.1.

Fig.1 Silicone Keyboard

5. Reliability Modeling

According to the procedures and methods in GJB/Z 299C-2006, the reliability modeling for silicone keyboard is established, as Fig.2.

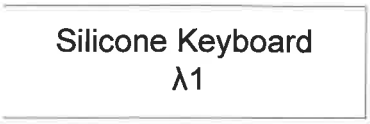

Fig.2 Silicone Keyboard Reliability Modeling

Product failure rate: $\lambda_s = \lambda_1$

Product MTBF: $MTBF = 1/\lambda_s$

6. Prediction Precondition

6.1 The components are only of two states of failure and normal, no third state.

6.2 All input is within the prescribed limits for product, without regard to the failure caused by error input.

6.3 Without regard to the simple structural elements in reliability modeling.

6.4 Assuming the personnel are completely reliable, no interaction problem between the personnel and the product.

6.5 The product failure is in compliance with exponential distribution.

6.6 The product failure is mutually independent.

7. Prediction Relevant Factors Determination

7.1 Environment temperature

According to the product service environment, 40℃ is the referring environment temperature and the junction temperature in the reliability prediction.

7.2 Electric stress coefficient

Considering the product component derating design, $U/U_{max} = 0.7$, $I/I_{max} = 0.7$ are the electric stress coefficients (current, voltage) in the reliability prediction.

8. Prediction Calculation

Calculate each unit failure rate according to components failure rate model, as Table 1. The prediction result is shown in Annex 1.

Table1 Unit Failure Rate

No.	Unit	Unit Failure Rate (10^{-6}/h)	Remark
1	Silicone keyboard	5.6295	The data needed for calculation is provided by the client.
Summary	Product overall failure rate $\lambda_{product}$	5.6295	

Calculated: $\lambda_{product}$ =5.6295 (10^{-6}/h)

Transfer to product mean time between failures (MTBF): MTBF =1/$\lambda_{product}$ =177636(h)

The silicone keyboard mean time between failures (MTBF) prediction value is 177636(h) (detailed data shown in Annex 1).

9. Prediction Result

Under the condition of referring environment temperature of 40℃ and electric stress coefficient of 0.7, reliability prediction for K-TEK-M275TP-FN-BL-NV-EMC-151B silicone keyboard shows mean time between failures (MTBF) prediction value is 177636(h).

Prepared by:

Reviewed by:

Approved by:

Test Department:

Issued Date:

Annex 1 Unit Failure Rate Statistical Chart

No.	Component Name	Model Specification	N	λ_b (λ_p)	π_E	π_Q	π_R	π_T	π_{TAPS}	π_K	π_{CV}	π_{SR}	π_{ch}	π_A	π_C	π_r	π_S	π_{S2}	π_L	π_P	π_{C2}	π_{CYC}	C_1	C_2	C_3	$N_{i,p}$ ($\times 10^{-6}$)
Silicone Keyboard																										
1	Chip	CH549L	1		1	0.5		0.27											1				0.2643	0.0342	0.1391	0.0955
2	ESD	LT-BV05C	9	0.072	1	0.4								1	1	0.6		0.2								0.0311
3	Diode	B5819W	2	0.072	1	0.4								1	1	0.6		0.2								0.0069
4	Common Mode Choke	BD-H60-30	2	0.002		0.5																				0.0020
5	Common Mode Choke 7h	BD-H07-30	2	0.002		0.5																				0.0020
6	Capacitor	100UF 1206B107K500NT	15	0.1365	1	0.5					1		1													1.0238
7	Capacitor	104 0805B104K500NT	8	0.0253	1	0.5					0.75	1	1													0.0759
8	Resistor	10K RS-03K103KT	2	0.054	1	0.6	1																			0.1080
9	Resistor	1.5K RS-03K152KT	101	0.054	1	0.6	1																			3.2724
10	Resistor	22R RS-03K220KT	2	0.054	1	0.6	1																			0.0648
11	Resistor	5.1K RS-03K512KT	6	0.054	1	0.6	1																			0.1944
12	Magnetic Bead	100R CMI201209U101KT	1	0.06	1	0.5																				0.0300
13	Inductor	0.47UH CMI201209VR47KT	2	0.002		0.5																				0.0020
14	MOSFET	APM2301	2	0.337	1	0.5				1				1	0.7	0.8										0.1887
15	FPC Plug	8P010MMS	1	0.0459	1	1														2.3						0.1056
16	LED White	FC-DA1608WD	99	0.0104	1	0.5		4.02							0.2											0.4139
17	LED Green	FC-DA1608GD	3	0.0104	1	0.5		4.02							0.2											0.0125
Silicone Keyboard Failure Rate																										5.6295