Shelf Life 5 Year Test Report

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1. Purpose

This test determine the shelf life of integrated circuit (IC) packages extended from 2 years to 5 years.

2. Scope

This test report is applied to the All multi-leaded and leadless component except WLCSP component type.

3. Introduction

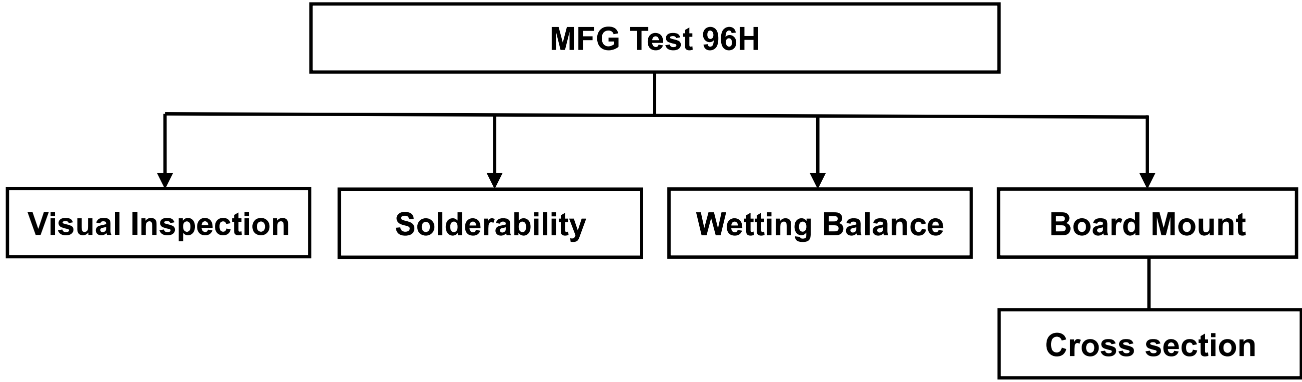
For the shelf-life evaluation documented in this report, components were exposed to a controlled environment, with known aging acceleration factors. The components were exposed to MFG (Mixed Flowing Gas) environment of their terminations. Results show that the ICs pass various examination after 96-h exposure to the harsh environmental.

4. Test Vehicle Information

Product	Package Type	Date code(YYWW)	Lead Finish
RTQ2106	TSSOP-14(PP)	2001	Matte Sn
RTX8929	WQFN4*4-32	1402	Matte Sn
RTQ2072	WETD-VQFN3*3-16	2316	NiPdAu

5. MFG Test condition and flow

Temp(°C)	RH(%)	H2S(ppb)	CL2(ppb)	NO2(ppb)
30±2	70±2	10+0/-4	10+0/-2	200±25



6. Summary of Test Results

6.1 Visual-Inspection

After 96hours exposure in MFG environment, 3pcs samples of each package were visual inspected with 50X magnification, no visible corrosion on samples' lead surface.

Package Type	S/S	Fail	Check Results after MFG 96h
TSSOP-14(PP)	3	0	Pass
WQFN4*4-32	3	0	Pass
WETD-VQFN3*3-16	3	0	Pass

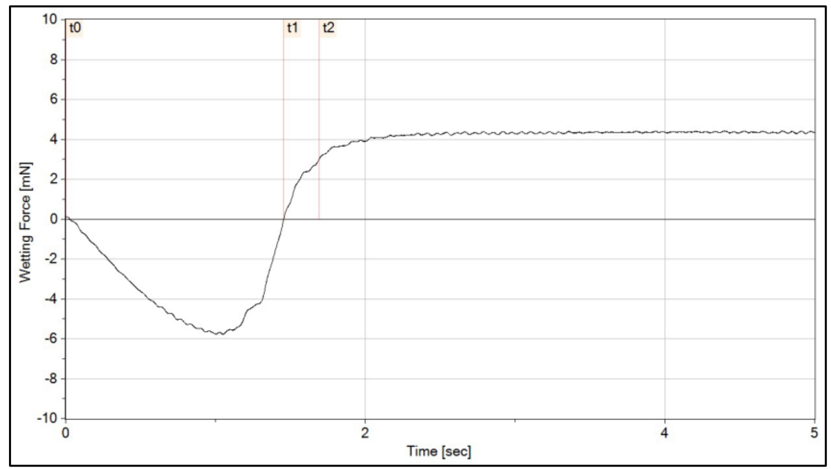
6.2 Solderability

After 96hours exposure in MFG environment, check test samples' solderability as "IPC/EIA/JEDEC J−STD−002" The pass criteria is "All leads shall exhibit a continuous solder coating free from defects for a minimum of 95% of the critical area. No failure on any test samples.

Package Type	S/S	Fail	Solder coverage is more than 95% and no visual problem
TSSOP-14(PP)	3	0	
WQFN4*4-32	3	0	
WETD-VQFN3*3-16	3	0	

6.3 Wetting-Balance

After 96hours exposure in MFG environment, check multi-leaded component packages' soldering performance wetting balance test as "IPC/EIA/JEDEC J−STD−002". The pass criteria is wetting times are <2s.



Package Type	S/S	Fail	After MFG 96h
TSSOP-14(PP)	1	0	1.45s

6.4 Board Mount

After 96hours exposure in MFG environment, check soldered to PCB with standard SMT process by a commercially available Pb-free alloy with composition of 96.5%Sn3%Ag0.5%Cu, to judge the solder joint.

Cross Sections of Solder Joints

Package Type	Check Results after MFG 96h	Fail
TSSOP-14(PP)		0
WQFN4*4-32		0
WETD-VQFN3*3-16		0

7. Long Term Storage Evaluation

Pick 9 product with > 5 years in storage warehouses to do evaluation.

7.1 Packaging Materials Evaluation

Package Type	Date Code (YYWW)	Moisture Barrier Bag			
		Air leakage	Deformation	Appearance	HIC discolor
SOP-8	2011	No	No	Normal	Normal
TSSOP-14	2001	No	No	Normal	Normal
SOT-563	2010	No	No	Normal	Normal
SOT-23-5	2030	No	No	Normal	Normal
QFN 3x3	1812	No	No	Normal	Normal
QFN 4x4	1402	No	No	Normal	Normal
QFN 5x5	2013	No	No	Normal	Normal
QFN 6x6	2009	No	No	Normal	Normal
QFN 7x7	2006	No	No	Normal	Normal

7.2 Tape Peel Strength Evaluation and ESD Testing

Package Type	Date Code (YYWW)	Peel Strength Test	Peel Strength Test Chart	ESD Test
SOP-8	2011	Pass (53.3g ~ 63.8g)	16.Force(g) Max Min Average Range 17.Measured 63.8 g 53.3 g 58.4 g 10.5 g	Pass
TSSOP-14	2001	Pass (21.4g ~ 69.7g)	16.Force(g) Max Min Average Range 17.Measured 69.7 g 21.4 g 40.0 g 48.2 g	Pass
SOT-563	2010	Pass (81.1g ~ 89.2g)	16.Force(g) Max Min Average Range 17.Measured 89.2 g 81.1 g 84.5 g 8.1 g	Pass

SOT-23-5	2030	Pass (49.3g ~ 67.9g)	16.Force(g) Max Min Average Range 17.Measured 67.9 g 49.3 g 61.6 g 18.7 g	Pass
QFN 3x3	1812	Pass (38.4g ~ 58.5g)	17.Measured 58.5 g 38.4 g 49.7 g 20.2 g	Pass
QFN 4x4	1402	Pass (24.2g ~ 63.0g)	16.Force(g) Max Min Average Range 17.Measured 63.0 g 24.2 g 48.4 g 38.8 g	Pass
QFN 5x5	2013	Pass (26.9g ~ 48.4g)	16.Force(g) Max Min Average Range 17.Measured 48.4 g 26.9 g 37.9 g 21.4 g	Pass
QFN 6x6	2009	Pass (69.2g ~ 92.4g)	16.Force(g) Max Min Average Range 17.Measured 92.4 g 69.2 g 79.6 g 23.2 g	Pass
QFN 7x7	2006	Pass (58.7g ~ 86.9g)	16.Force(g) Max Min Average Range 17.Measured 86.9 g 58.7 g 74.6 g 28.2 g	Pass

7.3 Solderability Evaluation

Package Type	Date Code (YYWW)	Solderability	
SOP-8	2011		Pass
TSSOP-14	2001		Pass
SOT-563	2010		Pass
SOT-23-5	2030		Pass
QFN 3x3	1812		Pass
QFN 4x4	1402		Pass
QFN 5x5	2013		Pass
QFN 6x6	2009		Pass
QFN 7x7	2006		Pass

8. Reference Documents

8.1 ASTM B827-92, Standard Practice for Conducting Mixed Flowing Gas (MFG)Environmental Tests

8.2 IPC/EIA/JEDEC J-STD-002, Solderability Tests for Components Leads, Terminations, Lugs, Terminals and Wires.

8.3 IPC J-STD-001, Requirements for Soldered Electrical and Electronic Assemblies

8.4 W. Abbott, The Development and Performance Characteristics of Mixed Flowing Gas Test Environments, IEEE

8.5 IEC 60068-2-60 Edition 3.0, Environmental Testing-Part 2-60: Test Ke: Flowing Mixed Gas Corrosion Test

8.6 G. Morris, R. Lukaszewski, C. Genthe, Environmental Contamination and Corrosion in Electronics: The Need for an Industrial Standard and Related Accelerated Test Method That Makes Sense

8.7 G. Morris, C. Genthe, R. Lukaszewski, Challenges and Best Practices in Mixed Flow Gas Corrosion Testing of Electronics

9. Summary

According to the results described, this Shelf Life 5 Year Test is acceptable. Completed a reliability evaluation on different packages and the results support a 5 year shelf life. This assumes the integrity of the moisture barrier bag seal has not been compromised during that time period. any questions or inquiries for regarding related products or service of Richtek, please contact us through our technical support center. (https://www.richtek.com/Contact%20Us)