Electronic Components
KEMET
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Tin Whisker Growth Results on Tin Surface Finished Products
Rev. B, 18 November 2014

Whisker growth test methods and conditions per JESD-201 and JEDEC22a121.01.
In case of deviation between the two methods, JESD-201 was used.

Definitions per JESD-201 and JEDEC22a121.01

Whisker Class Level

Class 3: Mission / Life critical applications such as military, aerospace and medical applications.
Pure tin and high tin content alloys are not typically acceptable.
Class 2: Business critical aplications such as Telecom Infrastructure equipment, High-end Servers, Automotive, etc.
(long product lifetimes).
Class 1: Industrial / consumer products (medium product lifetimes).
Class 1A: Consumer products (short product lifetimes).

Maximum Whisker Density Range

Low: < 10 whiskers per (mm^2)
Medium: 10 - 45 whiskers per (mm^2)
High: > 45 whiskers per (mm^2)

Whisker Definition

Spontaneous columnar or cylindrical filament emanating from the surface
Length ≥ 10µm.
Aspect ratio (l/w) > 2.

Preconditioning Exposure

A: No preconditioning
C: SnPb reflow conditions, 220°C peak
D: Pb-free reflow conditions, 260°C peak

	Configuration	Rectangular / Square 5 Side Termination			Inward Formed L-Shaped Leadframe						Ceramic Two Lead Radial Configuration		
	Applicable Products	Ceramic Chips			Aluminum (AO-CAP), Conductive Polymer (KO CAP), Tantalum MnO_2 Chips			Conductive Polymer (KO CAP), Tantalum MnO_2 Chips			C3xx, C6xx, C052 and C062 Ceramic Through-Hole Product Series		
	Example												
	Termination Code	C			T			T			C or T		
	Termination Finish	100% Matte Tin			100% Matte Tin			100% Matte Tin			100% Matte Tin		
	Finish Thickness	100 - 400 µ-inch			160 - 320 µ-inch			160 - 320 µ-inch			160 - 480 µ-inch		
	Barrier Plating	Nickel			Nickel			Copper			Nickel		
	Barrier Thickness	50 µ-inch min.			30 - 80 µ-inch			80 - 120 µ-inch			50 µ-inch min.		
	Terminals Inspected	18			18			18			18		
	Inspection Area per Terminal	3.4 mm^2			3.6 mm^2			3.6 mm^2			20.4 mm^2		
	Inspection Equipment / Mag	SEM / 3000X			SEM / 3000X			SEM / 3000X			SEM / 3000X		
	Preconditioning	A	C	D	A	C	D	A	C	D	A	C	D
Exposure	**Temperature / Humidity Storage** 30°C, 60% RH, 4000 hours	Whisker Count	0	0	0	0	0	0	0	0	0	0	0	0
		Longest Whisker	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		Meets Class Level	2	2	2	2	2	2	2	2	2	2	2	2
		Whisker Density Range	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
	High Temp / Humidity Storage 55°C and 85% RH, 4000 hours	Whisker Count	0	3	4	0	1	5	0	11	6	0	2	4
		Longest Whisker	n/a	26µm	20µm	n/a	34	22µm	n/a	35	34µm	n/a	25µm	20µm
		Meets Class Level	2	2	2	2	2	2	2	2	2	2	2	2
		Whisker Density Range	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
	Temperature Cycling -55°C to +85°C, 1500 cycles	Whisker Count	0	>45	0	0	0	0	0	0	0	0	6	0
		Longest Whisker	n/a	43µm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	30µm	n/a
		Meets Class Level	2	2	2	2	2	2	2	2	2	2	2	2
		Whisker Density Range	Low	High	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low