

Tin Whisker Growth Results on Tin Surface Finished Products
Rev. C, May 2022

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 applications 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 (mm²)
- Medium: 10 - 45 whiskers per (mm²)
- High: > 45 whiskers per (mm²)

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	Inward Formed L-Shaped Leadframe													
	Conductive Polymer (KO CAP and AO CAP) Tantalum MnO ₂ Chips			Conductive Polymer (KO CAP, ultra low ESR)			Conductive Polymer (KO CAP, standard ESR)			Conductive Polymer (KO CAP) Automotive Grade >= 75V Rated Voltage				
Example														
Termination Code	T			T			T			T				
Termination Finish	100% Matte Tin			100% Matte Tin			100% Matte Tin			100% Matte Tin				
Finish Thickness	160 - 320 µ-inch			160 - 320 µ-inch			160 - 320 µ-inch			160 - 320 µ-inch				
Barrier Plating	Nickel			Copper			Copper			Nickel				
Barrier Thickness	30 - 80 µ-inch			80 - 120 µ-inch			80 - 120 µ-inch			30 - 80 µ-inch				
Terminals Inspected	18			18			18			18				
Inspection Area per Terminal	3.6 mm ²			3.6 mm ²			3.6 mm ²			3.6 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
	High Temp / Humidity Storage 60°C and 90% RH, 4000 hours	Whisker Density Range	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
		Whisker Count	0	0	0	2	1	0	0	0	0	10	6	0
		Longest Whisker	n/a	n/a	n/a	20µm	15µm	n/a	n/a	n/a	n/a	35µm	29µm	n/a
	Temperature Cycling -55°C to +85°C, 1500 cycles	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
		Whisker Count	0	0	0	0	0	0	0	0	0	0	0	0
Temperature Cycling -55°C to +85°C, 1500 cycles	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	