

Tin Whisker Test Data – Chip Resistors

Product Research & Development Group Surface Mount Passive Component Team

Product: Thick Film Chip Resistors (Series CR)

Solder Coat
Finish: 100% matte Tin (Sn) over high porosity Nickel (Ni)

Item: Tin Whisker Growth Testing

P/Ns: 0603 and 1206 sizes
CR0603-16W-103JT
CR1206-8W-1002FT
CR1206-8W-103JT

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I. Test condition (NEMI Standard)

Tested per NEMI and JEDEC standards and guidelines:

JEDEC – JESD22-A104 for temperature cycling

ITEM	TEST CONDITION
Thermal Shock	-55 ~ 85°C / Dwell Time (20 mins.), 1000 cycles
High Temp. & Humidity Storage	60°C / 95% RH, 2000 hours
Room Temp. Storage	25 ± 5°C / 30 ~ 80% RH, 5000 hours

II. Test Results

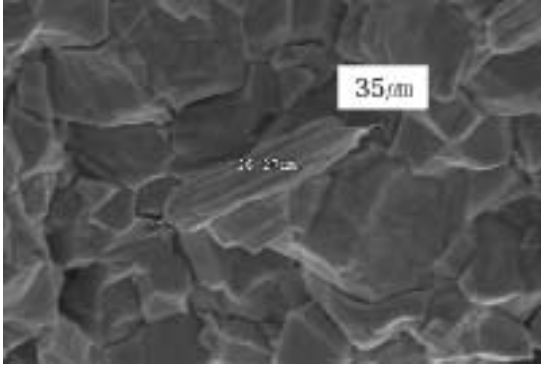
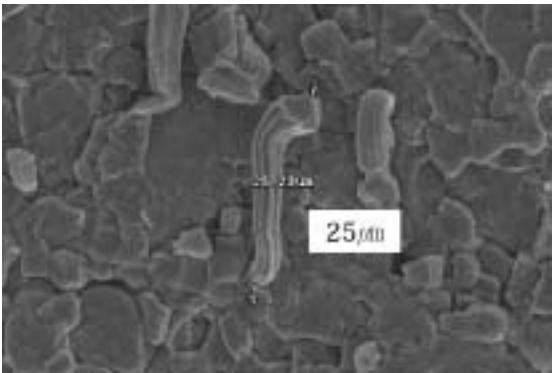
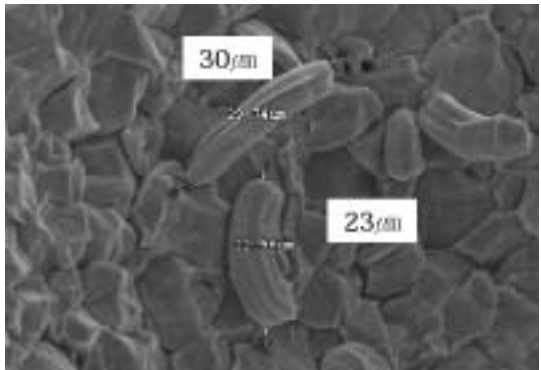
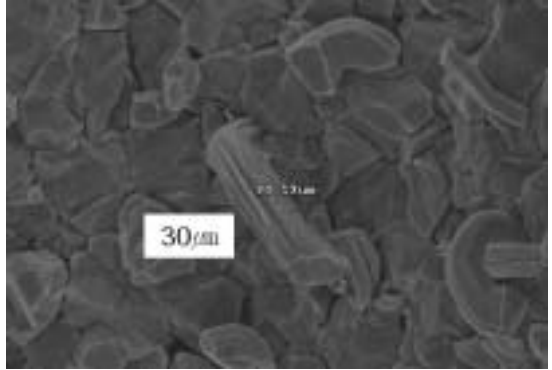
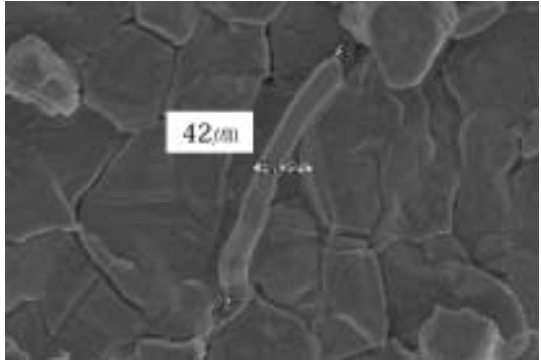
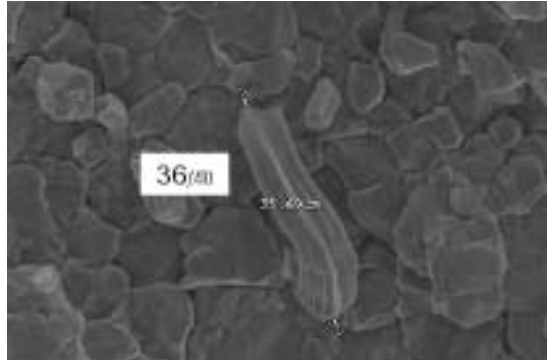
1) Test Data; 6 samples tested per value.

NO.	PART NO.	ITEM	WHISKERS DETECTED	MAX. LENGTH (µm)	MAX. ALLOWABLE TIN WHISKER (SPEC ≤ 50µm) RESULTS
1	CR0603-16W-103JT	Temperature /Humidity Storage	0/6	0	PASS
		Temperature Cycling/Thermal Shock	6/6	35.60	PASS
		Storage Test (Room Temperature)	0/6	0	PASS
2	CR1206-8W-1002FT	Temperature /Humidity Storage	0/6	0	PASS
		Temperature Cycling/Thermal Shock	6/6	35.85	PASS
		Storage Test (Room Temperature)	0/6	0	PASS
3	CR1206-8W-103JT	Temperature /Humidity Storage	0/6	0	PASS
		Temperature Cycling/Thermal Shock	6/6	42.20	PASS
		Storage Test (Room Temperature)	0/6	0	PASS

2) SEM – see next page

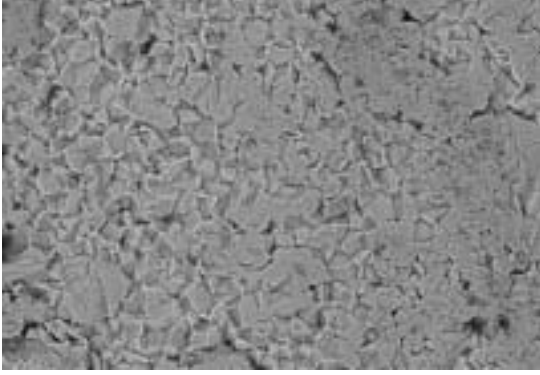
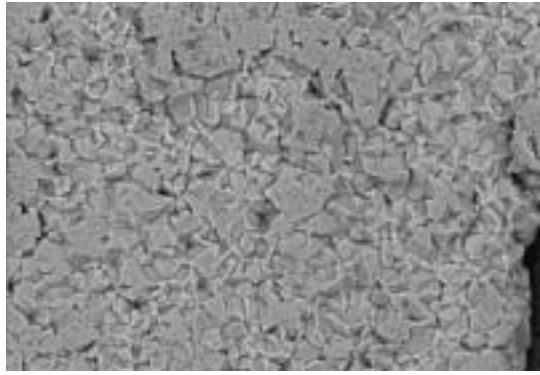
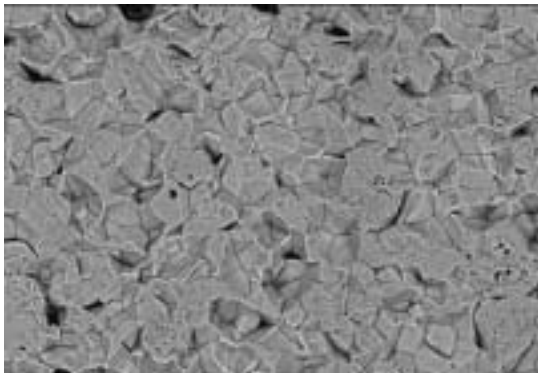
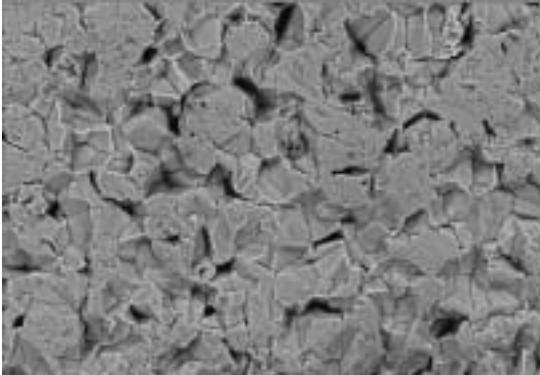
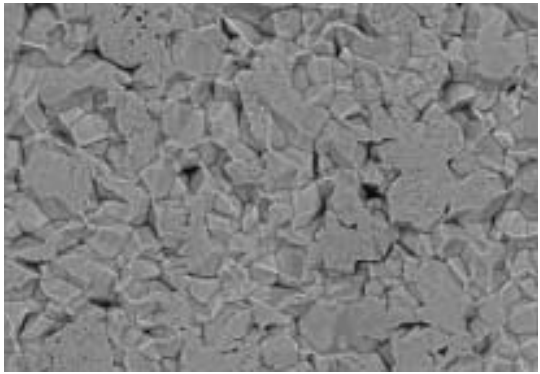
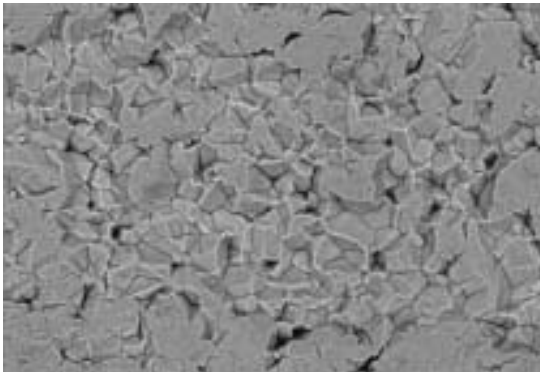
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2. SEM Analysis & Results

Thermal Shock	1,500x
CR0603-16W-103JT	
	
CR1206-8W-1002FT	
	
CR1206-8W-103JT	
	

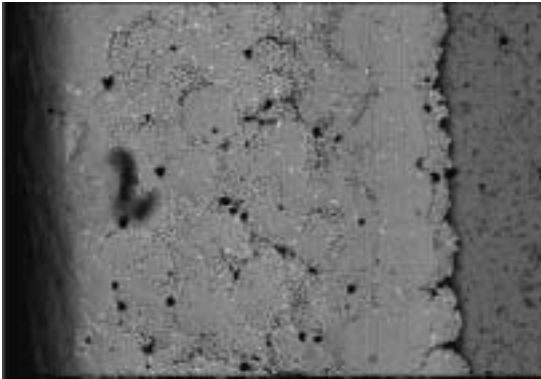

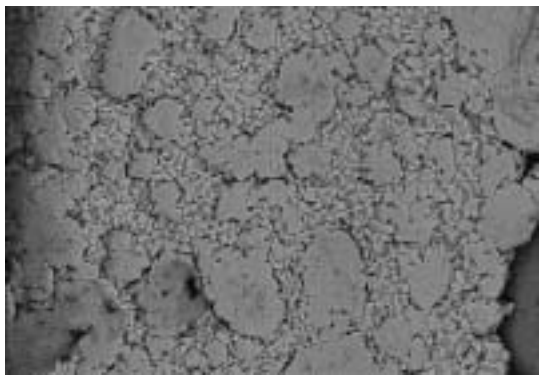
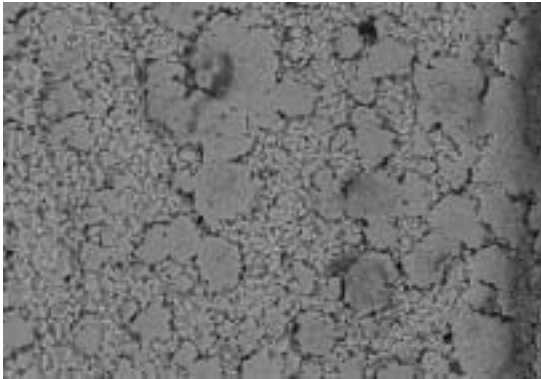
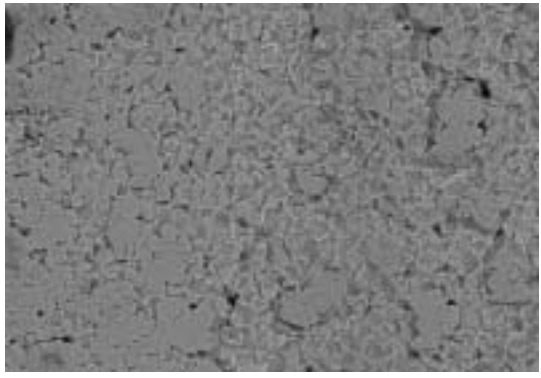
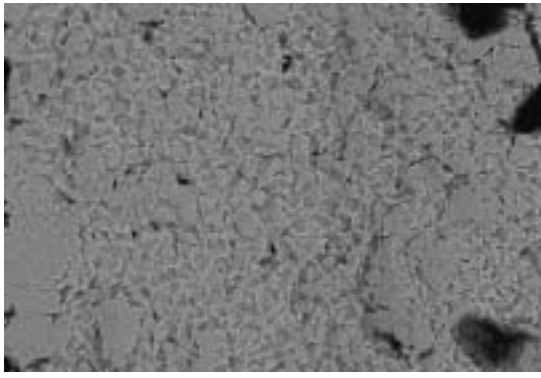
Tin Whisker Test Data – Chip Resistors

2. SEM Analysis & Results

High Temp. & Humidity Storage	1,500x
CR0603-16W-103JT	
	
CR1206-8W-1002FT	
	
CR1206-8W-103JT	
	

Tin Whisker Test Data – Chip Resistors

2. SEM Analysis & Results

Room Temperature Storage	1,000x
CR0603-16W-103JT	
	
CR1206-8W-1002FT	
	
CR1206-8W-103JT	
	

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3. Conclusion

Conclusion:

Based on the results that were performed in these tests, it was concluded that no Tin Whiskers grew greater than 50um's for any of the SMT passives components that were tested. 50um's is the industry standard for maximum allowable length for Tin Whiskers and the results clearly show that over significant periods of time involving temperature & humidity storage, temperature cycling, and storage at room temperature of this type of SMT passive components, Tin Whiskers will not typically grow over 43um's for thick film chip resistors. Tin Whiskers can certainly be grown in excess of 50um's for this type of SMT passives when they are exposed to certain and specific environmental conditions such as low DC bias (1.5V DC), high humidity (>80 % R.H), and higher atmospheric pressures. However, Tin Whiskers will not grow or have not been seen to grow in excess of 50um's when they are subjected to a standard re-flow process typically associated with this type of SMT passive components. While tests conducted by others may yield different results, Venkel did not observe any Tin Whisker growth in excess of 50um's and hence we believe are not a major concern when processing these types of SMT passive components.

Please contact the engineering department at Venkel Ltd. if any additional information is required or specific topics need to be discussed regarding these reports.