

TIN WHISKER TANTALUM DATA REPORT

Product: **Tantalum Chip Capacitors**

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

Item: Tin Whisker Growth & Density Testing

Venkel P/N: TA016TCM106KBR

Date Performed: September 2007

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1. Description

Venkel P/N	Dimension (L x W)	Chip Thickness	Capacitance	Capacitance Tolerance	Rated Voltage	Termination/ Plating
	(mm)	(mm)	(μ F)	(%)	(V)	
TA016TCM106KBR	3.5 x 2.8	1.9	10 μ F	\pm 10%	16	42 Alloy / Ni / Sn

2. Test Condition

Test	Test Conditions	Number of Lots	Sample Size/ Acceptance Criteria	Test
Pb Free Plating Technology				1 month
Preconditioned Low Constant Temperature	20-30°C 30-85%RH 1 months	3	15/0	OK
Preconditioned High Constant Temperature	50-60°C 80-95%RH 1 month	3	15/0	OK
Preconditioned Temperature Cycle	-40 to 85°C 20 Minute Soak 500 cycles	3	15/0	OK

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3-1. Result Summary: Preconditioned Low Constant Temperature (1 month)

Date of Inspection	Test Condition	Exposure Time	Lot-Sample Number	Sample Type	Substrate	Under Plating	Bath Type	Tin Plate Thickness	Date of Plating	Type of Whisker	Axial Length of Longest Whisker	Whisker density in 250×250µm ² area
July. 08 2005	Preconditioned Low Constant Temperature	1 month	1 - 1	Chip	42 Alloy	Ni	Matte	5 µm	Jan. 26 2005	-	0µm	0 ea
			1 - 2							-	0µm	0 ea
			1 - 3							-	0µm	0 ea
			1 - 4							-	0µm	0 ea
			1 - 5							-	0µm	0 ea
			1 - 6							-	0µm	0 ea
			1 - 7							-	0µm	0 ea
			1 - 8							-	0µm	0 ea
			1 - 9							-	0µm	0 ea
			1 - 10							-	0µm	0 ea
			1 - 11							-	0µm	0 ea
			1 - 12							-	0µm	0 ea
			1 - 13							-	0µm	0 ea
			1 - 14							-	0µm	0 ea
			1 - 15							-	0µm	0 ea
July. 08 2005	Preconditioned Low Constant Temperature	1 month	2 - 1	Chip	42 Alloy	Ni	Matte	5 µm	Jan. 26 2005	-	0µm	0 ea
			2 - 2							-	0µm	0 ea
			2 - 3							-	0µm	0 ea
			2 - 4							-	0µm	0 ea
			2 - 5							-	0µm	0 ea
			2 - 6							-	0µm	0 ea
			2 - 7							-	0µm	0 ea
			2 - 8							-	0µm	0 ea
			2 - 9							-	0µm	0 ea
			2 - 10							-	0µm	0 ea
			2 - 11							-	0µm	0 ea
			2 - 12							-	0µm	0 ea
			2 - 13							-	0µm	0 ea
			2 - 14							-	0µm	0 ea
			2 - 15							-	0µm	0 ea

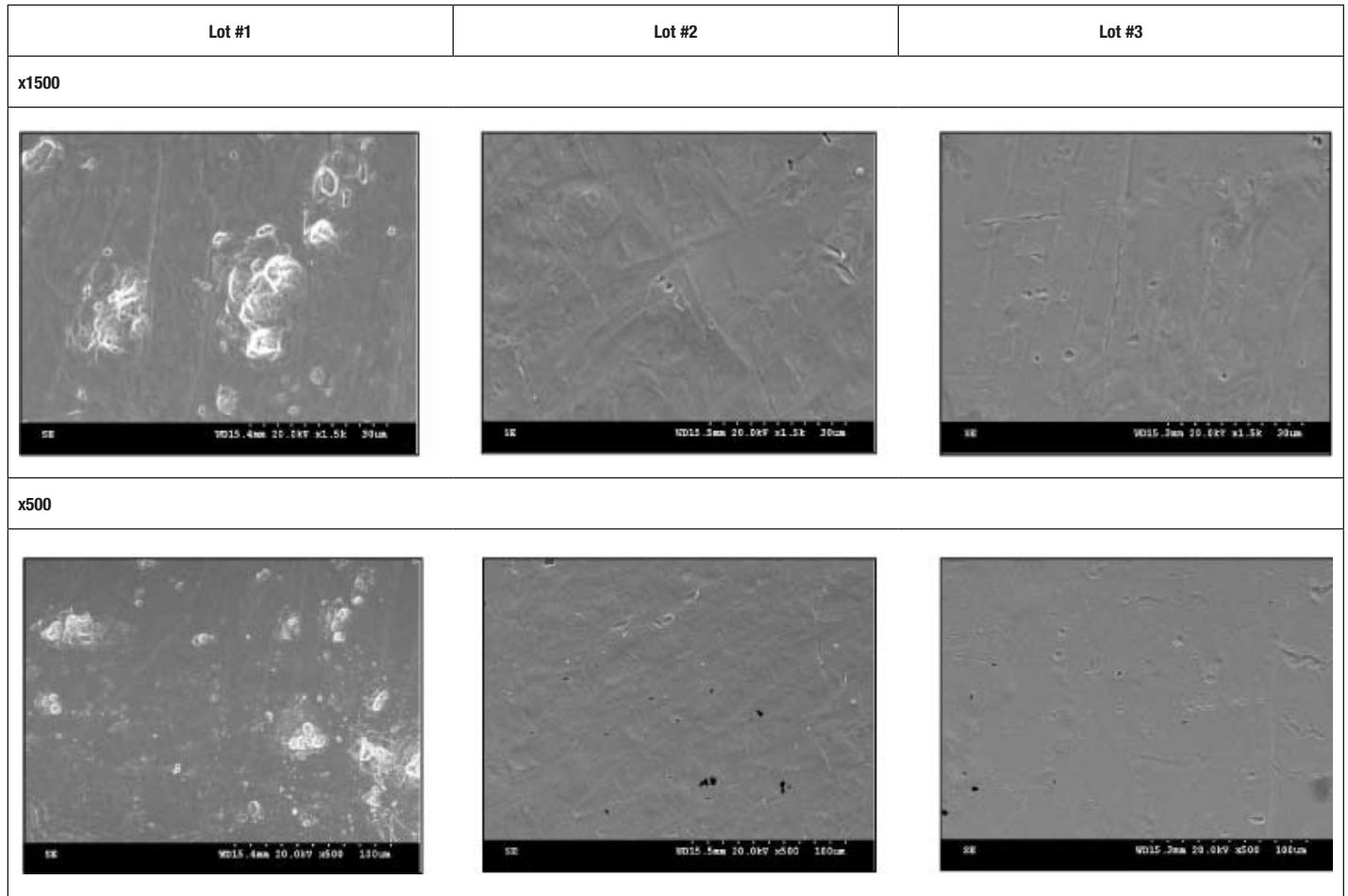
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3-1. Result Summary: Preconditioned Low Constant Temperature (1 month) (continued)

Date of Inspection	Test Condition	Exposure Time	Lot-Sample Number	Sample Type	Substrate	Under Plating	Bath Type	Tin Plate Thickness	Date of Plating	Type of Whisker	Axial Length of Longest Whisker	Whisker density in 250x250um ² area
July 08 2005	Preconditioned Low Constant Temperature	1 month	3 - 1	Chip	42 Alloy	Ni	Matte	5 um	Jan. 26 2005	-	0µm	0 ea
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			3 - 3							-	0µm	0 ea
			3 - 4							-	0µm	0 ea
			3 - 5							-	0µm	0 ea
			3 - 6							-	0µm	0 ea
			3 - 7							-	0µm	0 ea
			3 - 8							-	0µm	0 ea
			3 - 9							-	0µm	0 ea
			3 - 10							-	0µm	0 ea
			3 - 11							-	0µm	0 ea
			3 - 12							-	0µm	0 ea
			3 - 13							-	0µm	0 ea
			3 - 14							-	0µm	0 ea
			3 - 15							-	0µm	0 ea

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3-2. SEM image: Preconditioned Low Constant Temperature (1 month)



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4-1. Result Summary: Preconditioned High Constant Temperature (1 month)

Date of Inspection	Test Condition	Exposure Time	Lot-Sample Number	Sample Type	Substrate	Under Plating	Bath Type	Tin Plate Thickness	Date of Plating	Type of Whisker	Axial Length of Longest Whisker	Whisker density in 250×250um ² area
July. 08 2005	Preconditioned High Constant Temperature	1 month	1 - 1	Chip	42 Alloy	Ni	Matte	5 um	Jan. 26 2005	-	0µm	0 ea
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			1 - 4							-	0µm	0 ea
			1 - 5							-	0µm	0 ea
			1 - 6							-	0µm	0 ea
			1 - 7							-	0µm	0 ea
			1 - 8							-	0µm	0 ea
			1 - 9							-	0µm	0 ea
			1 - 10							-	0µm	0 ea
			1 - 11							-	0µm	0 ea
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			1 - 14							-	0µm	0 ea
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			2 - 4							-	0µm	0 ea
			2 - 5							-	0µm	0 ea
			2 - 6							-	0µm	0 ea
			2 - 7							-	0µm	0 ea
			2 - 8							-	0µm	0 ea
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			2 - 12							-	0µm	0 ea
			2 - 13							-	0µm	0 ea
			2 - 14							-	0µm	0 ea
			2 - 15							-	0µm	0 ea

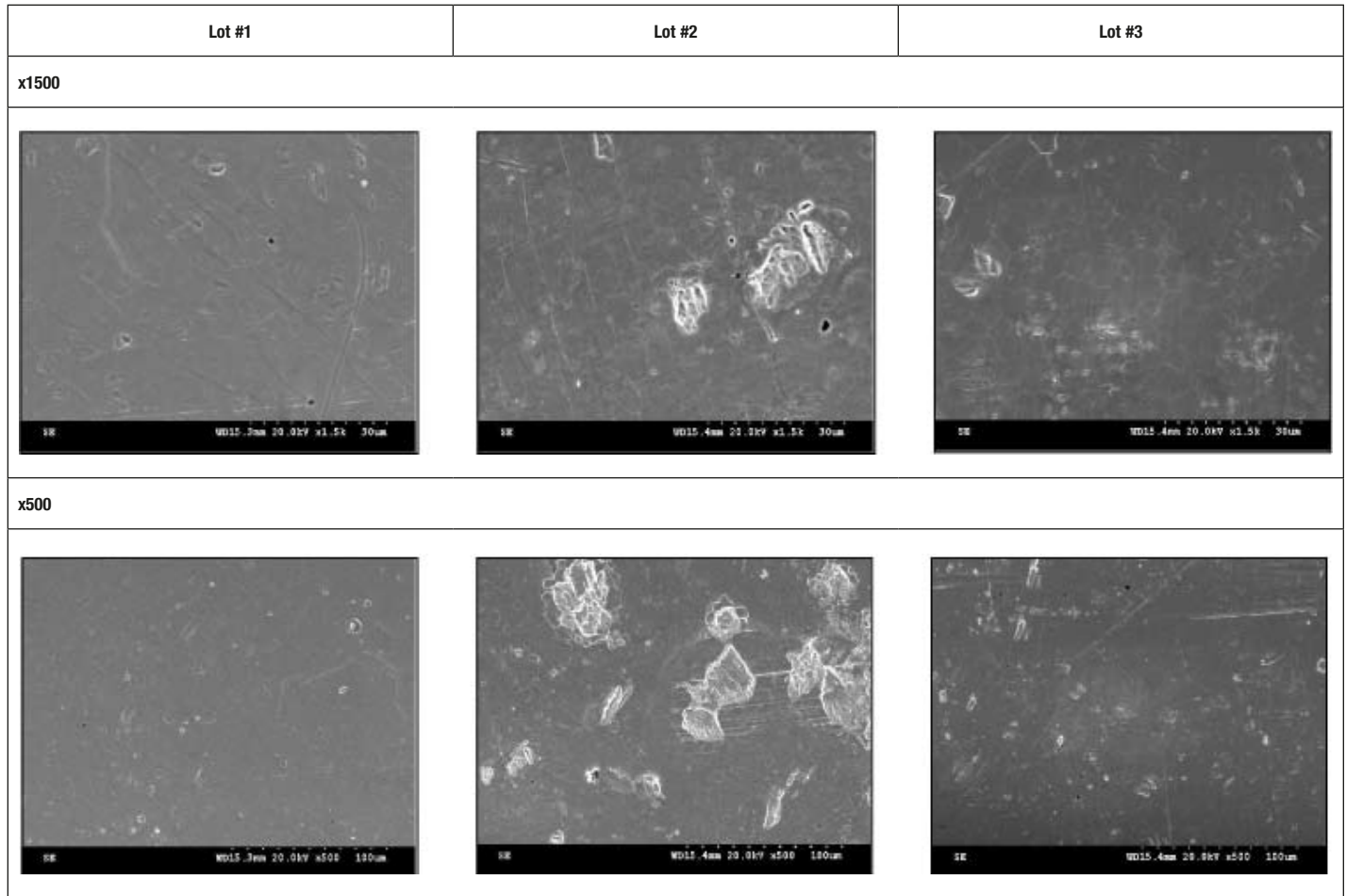
TIN WHISKER TANTALUM DATA REPORT

4-1. Result Summary: Preconditioned High Constant Temperature (1 month) (continued)

Date of Inspection	Test Condition	Exposure Time	Lot-Sample Number	Sample Type	Substrate	Under Plating	Bath Type	Tin Plate Thickness	Date of Plating	Type of Whisker	Axial Length of Longest Whisker	Whisker density in 250×250um ² area
July 08 2005	Preconditioned High Constant Temperature	1 month	3 - 1	Chip	42 Alloy	Ni	Matte	5 um	Jan. 26 2005	-	0µm	0 ea
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			3 - 6							-	0µm	0 ea
			3 - 7							-	0µm	0 ea
			3 - 8							-	0µm	0 ea
			3 - 9							-	0µm	0 ea
			3 - 10							-	0µm	0 ea
			3 - 11							-	0µm	0 ea
			3 - 12							-	0µm	0 ea
			3 - 13							-	0µm	0 ea
			3 - 14							-	0µm	0 ea
			3 - 15							-	0µm	0 ea

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4-2. SEM image: Preconditioned High Constant Temperature (1 month)



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5-1. Result Summary: Preconditioned Temperature Cycle

Date of Inspection	Test Condition	No. of Cycles	Lot-Sample Number	Sample Type	Substrate	Under Plating	Bath Type	Tin Plate Thickness	Date of Plating	Type of Whisker	Axial Length of Longest Whisker	Whisker density in 250×250µm ² area
July. 08 2005	Preconditioned Temperature Cycle	500 cycles	1 - 1	Chip	42 Alloy	Ni	Matte	5 µm	Jan. 26 2005	-	0µm	0 ea
			1 - 2							-	0µm	0 ea
			1 - 3							-	0µm	0 ea
			1 - 4							-	0µm	0 ea
			1 - 5							-	0µm	0 ea
			1 - 6							-	0µm	0 ea
			1 - 7							-	0µm	0 ea
			1 - 8							-	0µm	0 ea
			1 - 9							-	0µm	0 ea
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July. 08 2005	Preconditioned Temperature Cycle	500 cycles	2 - 1	Chip	42 Alloy	Ni	Matte	5 µm	Jan. 26 2005	-	0µm	0 ea
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			2 - 3							-	0µm	0 ea
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			2 - 9							-	0µm	0 ea
			2 - 10							-	0µm	0 ea
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			2 - 13							-	0µm	0 ea
			2 - 14							-	0µm	0 ea
			2 - 15							-	0µm	0 ea

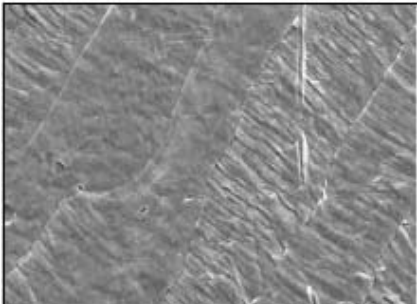
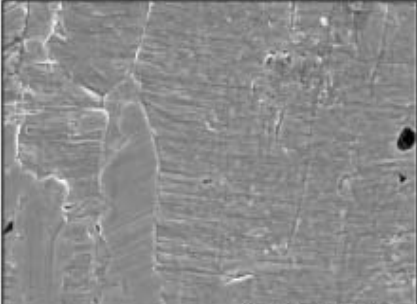

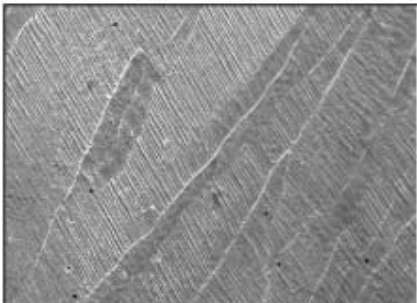
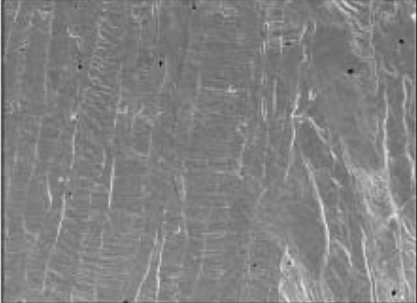
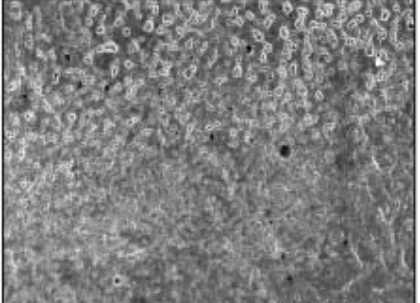
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5-1. Result Summary: Preconditioned Temperature Cycle (continued)

Date of Inspection	Test Condition	No. of Cycles	Lot-Sample Number	Sample Type	Substrate	Under Plating	Bath Type	Tin Plate Thickness	Date of Plating	Type of Whisker	Axial Length of Longest Whisker	Whisker density in 250x250um ² area
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			3 - 7							-	0µm	0 ea
			3 - 8							-	0µm	0 ea
			3 - 9							-	0µm	0 ea
			3 - 10							-	0µm	0 ea
			3 - 11							-	0µm	0 ea
			3 - 12							-	0µm	0 ea
			3 - 13							-	0µm	0 ea
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5-2. SEM image: Preconditioned Temperature Cycle

Lot #1	Lot #2	Lot #3
x1500		
 <p>SEM WD15.4mm 20.0kV x1.5k 30um</p>	 <p>SEM WD15.2mm 20.0kV x1.5k 30um</p>	 <p>SEM WD15.3mm 20.0kV x1.5k 30um</p>
x500		
 <p>SEM WD15.4mm 20.0kV x500 100um</p>	 <p>SEM WD15.2mm 20.0kV x500 100um</p>	 <p>SEM WD15.3mm 20.0kV x500 100um</p>

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6. 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 0um's for Tantalum Capacitors. 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.