Qualification of Sn-Pb Termination on Ceramic MLCC Products

Johanson Dielectrics' tin-lead plated products are offered for high reliability, aerospace, and other applications where tin whiskering is a concern. The plating is tin-lead over nickel barrier with 5% minimum lead content. The lead content of the plating in every manufacturing lot is verified using the XRF method, and this data is available upon request. The tin-lead plated products fulfill MIL-PRF-55681 finish requirements.

TIN WHISKER QUALIFICATION

OF MLCC PASSIVE COMPONENT FAMILY

PRODUCED BY JOHANSON

RESULTS:

Three (3) separate representative lots of Johanson Multi-Layer Ceramic Capacitors (MLCC) all plated on the same Johanson plating line, completed and meet all iNEMI acceptance requirements of:

- JEDEC JESD201 Environmental Acceptance Requirements for Tin Whisker Susceptibility of Tin and Tin Alloy Surface Finishes for Class 2 products
- JEDEC JESD22-A121A Test Method for Measuring Whisker Growth on Tin & Tin Alloy Surface Finishes

All samples exhibited no (zero) tin whisker growth during both specified storage tests, and ≤ 30 micron tin whisker growth during temperature cycling, therefore meeting the 45 micron specified maximum.

DETAILS:

Johanson Dielectrics MLCCs tested:

JTI Part Number	Part Description	EIA Size	Manufacturing Order Number	Lot Number	Test ID
500R11W103MV4	50VDC, 10nF, MLCC	0504	145110-03	234-6001	C1
302R18W102KV4	3KV, 1nF, MLCC	1206	441062-00	234-6071	C2
102S43W223KV4	1KV, 22nF, MLCC	1812	412825-00	131-6064	C4

Nine (9) samples of each part number were tested in each of the three Tin Whisker tests conducted in parallel and described in Figure 1. All three tests were run as specified for class 2 products, i.e., 1500 temperature cycles, and 4000 hours for each of the storage tests.

Whiskers Tests to perform according to the JEDEC Standards			
Test definition	Temperature cycling	Room temperature/Humidity storage	High temperature/humidity storage
Condition	-55 +0/-10°C to 85 +10/-0°C or -40 +0/-10°C to 85 +10/-0°C Soak : 10 mn / 3 cycles/hr **Readout** : every 500 cycles Minimum duration : 1000[v] cycles Minimum duration : 1500[iii] cycles for class 2 products	30±2°C 60±3 %RH[v] **Readout** : every 1000hr Minimum duration : 3000 hr[v] Minimum duration : 4000 hr[iii] for class 2 products	60±5°C 87+3/-2 %RH[v] or 55±3°C 85±3 %RH[iii] **Readout** : every 1000hr Minimum duration : 3000 hr[v] Minimum duration : 4000 hr[iii] for class 2 products
Whisker control and sampling	- Scanning Electron Microscope (SEM) with a magnification X300 - 3 sample locations for coupons and 3 visible sides for components Sample - 3 Lots per stress with 2 samples with 96 screening inspection and 18 Detailed inspection per read-out for Multi-leaded component - 3 Lots per stress with 3 samples with 18 screening inspection and 18 Detailed inspection per read-out for passive and discrete components with 4 leads or fewer		
Criteria	Equivalent or better to reference part with Pb or if not: < 40µm for Room temperature/Humidity storage and High temperature/humidity storage < 45µm for Temperature cycling		

Figure 1