



## TIN WHISKER FAMILY QUALIFICATION – CLASS 2

### ALL SERIES-E, SERIES-L & SERIES-S HIGH-Q MULTILAYER CERAMIC CAPACITORS

PRODUCED BY JOHANSON TECHNOLOGY INC.

#### RESULTS:

All Johanson Series-E (S42E, S48E, S58E), Series-L (R05L) & Series-S (R07S, R14S, R15S) High-Q Multilayer Ceramic Capacitors are qualified by similarity based on the test results herein.

Three (3) separate, representative, Johanson High-Q Multilayer Ceramic Capacitors all plated on the same Johanson plating line, completed and meet all 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  $\leq 43$  micron tin whisker growth during temperature cycling, therefore meeting the 45 micron specified maximum. This qualifies all Johanson High-Q Multilayer Ceramic Capacitors by similarity.

**DETAILS:** Johanson High-Q Multilayer Ceramic Capacitors tested:

JTI Part Number	Part Description	EIA Size	Manufacturing Order Number	Lot Number	Test ID
_R07S100_V	MLCC, S-Series, High-Q	0402	523539-03	513-6123	C1
_R14S150_V	MLCC, S-Series, High-Q	0603	526468-04	514-6127	C2
_R15S161_V	MLCC, S-Series, High-Q	0805	426191-05	421-6081	C3

Nine (9) samples of each part number were tested in each of the three (3) Tin Whisker tests conducted in parallel and described in Figure 1. All three (3) 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
<b>Condition</b>	-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 <b>Readout</b> : every 500 cycles  Minimum duration : 1000 <sup>v</sup> cycles  Minimum duration : 1500 <sup>iii</sup> cycles for class 2 products	30±2°C 60±3 %RH <sup>v</sup>  <b>Readout</b> : every 1000hr  Minimum duration : 3000 hr <sup>v</sup>  Minimum duration : 4000 hr <sup>iii</sup> for class 2 products	60±5°C 87+3/-2 %RH <sup>v</sup> or 55±3°C 85±3 %RH <sup>iii</sup>  <b>Readout</b> : every 1000hr  Minimum duration : 3000 hr <sup>v</sup>  Minimum duration : 4000 hr <sup>iii</sup> for class 2 products
<b>Whisker control and sampling</b>	- 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		
<b>Criteria</b>	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

\* **Class 2 products** are business critical applications such as Telecom Infrastructure equipment, High-end Servers, Automotive, etc., requiring long product lifetimes and minimal downtime.

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 APRIL 2016, rev B