



JOHANSON DIELECTRICS INC.

15191 Bledsoe Street, Sylmar, Ca. 91342 Phone (818) 364-9800 Fax (818) 364-6100

Peak Reflow Times, Temperatures and the Impact of MSL on Johanson Ceramic Capacitors

John Maxwell, Director of Product Development

The change to lead free soldering with its corresponding increase in soldering temperatures raises a number of assembly related process questions primarily because of plastic package limitations.

- 1) Maximum peak reflow temperature
- 2) Time at peak reflow temperature
- 3) Maximum number of assembly reflow cycles
- 4) Maximum number of rework cycles
- 5) MSL rating

Multi-layer ceramic capacitors (MLCC) do not have time and temperature limitations like plastic molded components due to the construction of those capacitors. There are no polymers or other temperature sensitive materials used minimizing the impact of increased soldering temperatures.

Ceramic capacitors have been assembled without problems into leaded components for decades using high temperature solders that have melting points as high as 309°C so lead free peak temperatures of 260°C present no soldering temperature issues. This does not mean that solder profiles can be ignored as there can be thermal shock cracking in wave soldering or during assembly cool down. The solder process needs to be controlled but no different that what is required for standard tin lead solder alloys.

The maximum time at temperature, number of reflow solder cycles or re-work cycles are not limited by ceramic capacitors but by the assembly laminate and plastic molded components. The board can blister, de-laminate and have plated thru hole failures. Plastic molded components may crack or blister due to absorbed moisture. Those components limit time at temperature and number of solder cycles, not the MLCC.

Due to the very nature and materials used in the manufacture of ceramic capacitors there are no moisture absorbing materials used nor are there critical interfaces within the MLCC that can crack or delaminate. This is not the case for PC boards and plastic molded components that are moisture sensitive to water absorption of the plastics themselves. MLC capacitors are MSL level 1 @ 260°C by construction and materials used.

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