

## Post-Processing Color Change of Rogers RO4000® Series Materials

Rev. V1

### Introduction

M/A-COM Technology Solutions packages a variety of devices using substrates and lids composed of RO4000® Series high frequency circuit materials manufactured by Rogers Corporation. These materials are glass reinforced hydrocarbon/ceramic laminates designed for performance sensitive applications.

This substrate material has several qualities desirable for RF microwave circuits, such as:

- Stable electrical properties over a broad frequency range
- Low dielectric loss
- Thermal coefficient of expansion (CTE) that allows for excellent dimensional stability
- Tg of > 280°C

For air cavity integrated circuit packages utilizing these substrates, the lids are also made of the same RO4000® Series material. The lids are sealed to the substrate using an epoxy. Since the CTE's of both the lid and substrate are the same, the final completed package is extremely robust.

These packages are designed to withstand Pb-free assembly reflow conditions which are typically at a maximum of 260°C. One of the characteristics of the RO4000® Series material is that it undergoes a slight color change when exposed to temperatures above approximately 125°C.

This color change is normal and “cosmetic” only and has no impact on performance or reliability. Full reliability and qualification testing was performed on these package materials. Following are the results:

### Temperatures < approximately 125°C



### Temperatures > approximately 125°C



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**Objective of Analysis**

This report details the results of the supplier package qualification that was performed to validate the manufacturing processes and materials used in the assembly of the 7mm x 7mm 16-Lead cavity laminate RoHS compliant package. The MAA-010512 was used as the test vehicle.

**Test Conditions and Results**

The compliance criterion is pre/post data comparisons of room temperature RF measurements.

Group	Test	Conditions	Quantity	Pass	Fail
A	Pre-Bake	125°C, 24 Hrs, unbiased	152	152	0
A	Preconditioning	MSL3, +60°C / 60% RH, 52 Hrs Followed by a 3x Reflow (260°C Max)	152	152	0
B	Temp Cycle	-65 to +150°C, 500 cycles, 15 min dwells	76	76	0
C	UFAST	+130°C / 85% RH, 96 Hrs With no bias applied	76	76	0
G	DPA	External/Internal Inspection Bond Pull & Die Shear	6	6	0

**Conclusion**

Based on the above data the 7mm x 7mm 16-Lead cavity laminate RoHS compliant package is considered to have passed M/A-COM Technology Solutions' package qualification requirements and is released for production assembly. It was verified that the change in package color was cosmetic only and has no impact on device reliability or package integrity.