



Product Change Notice

Notice: #150106 MSL 4 Upgrade

Date: January 6, 2015

To Our Valued Customer:

We appreciate your use of VI Chip products. Our commitment to customer satisfaction is demonstrated by our notification to you of the following change.

Description:

The FULL and HALF sized VI Chip packages will be upgraded from MSL 6 (245 °C) & MSL 5 (225 °C) to MSL 4 (245 °C) by the use of a new mold compound.

For more information on MSL (Moisture Sensitivity Level), please refer to the latest version of IPC-M-109 obtainable through www.ipc.org

Products Affected:

All VI Chip products in the FULL and HALF size packages.

Schedule / Date codes:

Affected products with a date code of 1528 (July 6, 2015) will have the new mold compound and will be marked on shipping materials as MSL 4 capable.

Data sheets will be updated on July 6, 2015.

Action Required:

No actions are required.

This improvement may allow for improvements in customer assembly processes.

Contact your local Vicor representative for more information.

Technical Marketing contact:

Ian Mazsa

imazsa@vicr.com

978-749-3247



MSL4 Qualification for Full and Half VI Chip Products

December 1, 2014



Purpose

The Moisture Sensitivity Level (MSL) for Full and Half VI Chips has been improved to MSL4 for lead free reflow (245°C peak) through the use of a new mold compound material. The improved package robustness increases floor life to 72 hours for customers.

Section I: Mold Compound Physical Comparison

Mold Compound Background

The mold compound satisfies three packaging requirements for VI Chips. First, it provides encapsulation of the PCB assembly and components. Second, it provides a dielectric for voltage differences of components, terminations and pads. Third, it provides a thermal path for heat generated during the operation of the VI Chip. Mold compound plays a critical role in the MSL performance of VI Chips.

Current Mold Compound

The current mold compound meets all of the packaging requirements, however, it cannot provide MSL performance better than MSL6 at 245°C for all VI Chip products. Its structural modulus at room temperature is low giving it low stress and therefore good electrical performance from the stress sensitive transformer ferrite cores. Its low structural modulus at elevated temperature and moisture absorption characteristics are factors that contribute to its limited MSL performance.

The new mold compound also meets all of the packaging requirements and is qualified at MSL4 245°C. Its structural modulus, adhesion and moisture resistance is higher than the current mold compound, which is needed to achieve MSL4. The new mold compound passes all reliability testing after exposure to MSL4 245°C reflow conditioning.

Critical MSL Material Performance Characterization

A more hydrophobic mold compound with excellent adhesion characteristics was needed to improve MSL performance. Moisture can weaken the interfacial adhesion and increase overall package stress, resulting in failure such as solder shorting during reflow.

The new mold compound is significantly more hydrophobic than the current material; see Chart 1 below for moisture uptake comparative data.

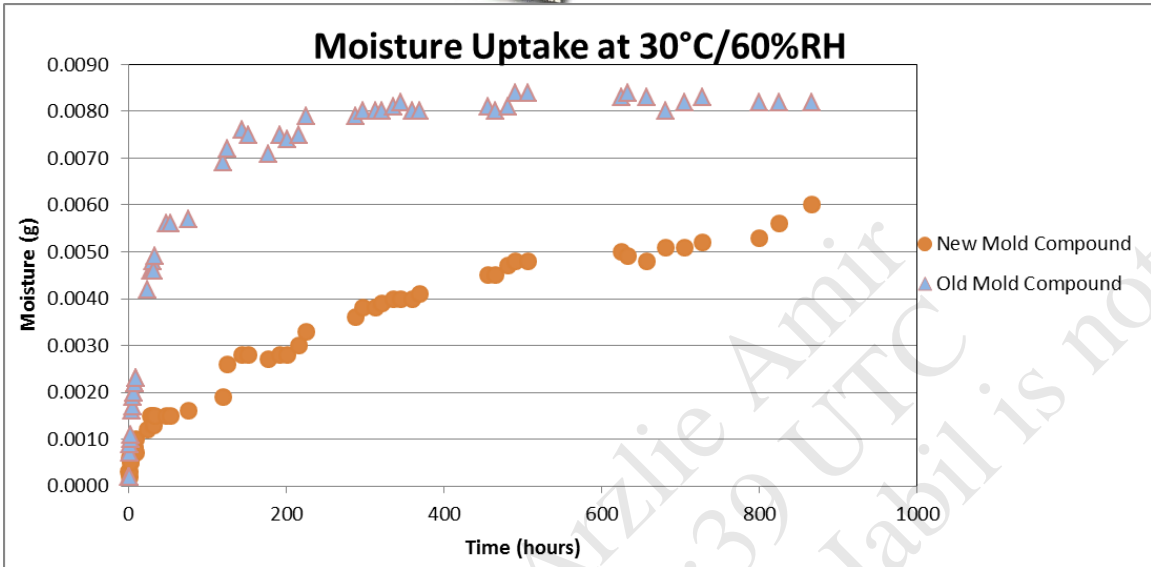


Chart 1: Mold Compound Moisture Uptake Comparison

Shear strength was evaluated to characterize adhesion to laminate and solder mask over laminate with the new and the old mold compounds. The new compound has significantly higher shear strength than the old mold compound on both substrates evaluated, further supporting the contrast in MSL performance observed between the two materials. See Chart 2 for comparative shear test data.

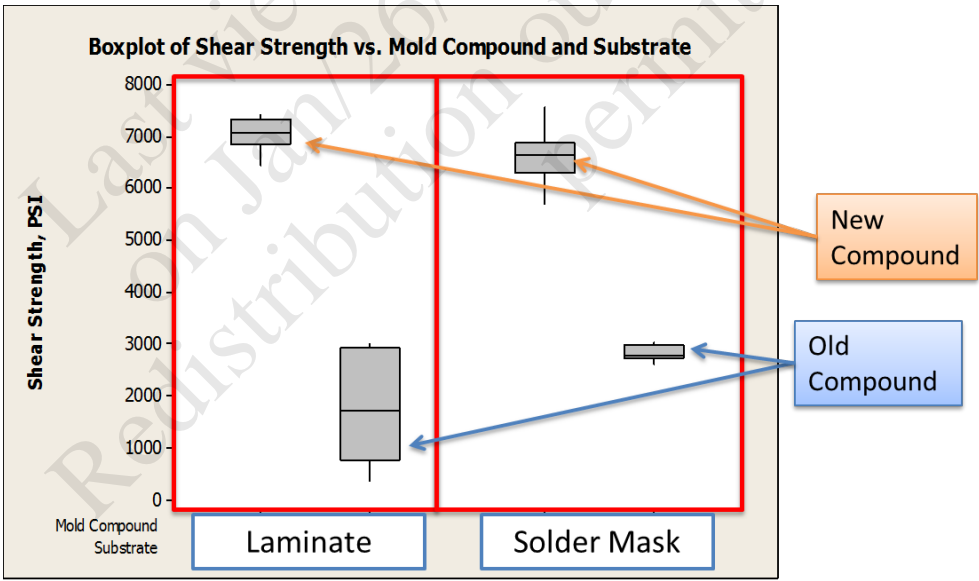


Chart 2 Shear Test Data for New and Old Mold Compounds



The thermal characteristics of the new and old mold compounds were evaluated at equivalent output power as well as power dissipation. The results for both tests were comparable, confirming that there was no impact to thermal performance.

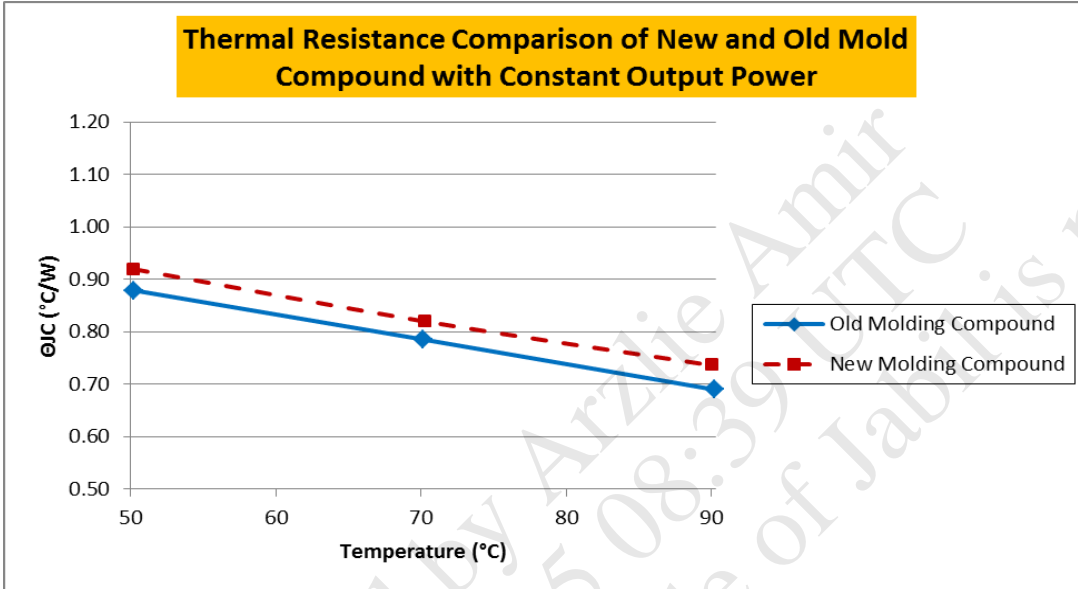


Chart 3: Thermal Resistance of New and Old Mold Compound with Constant Output Power

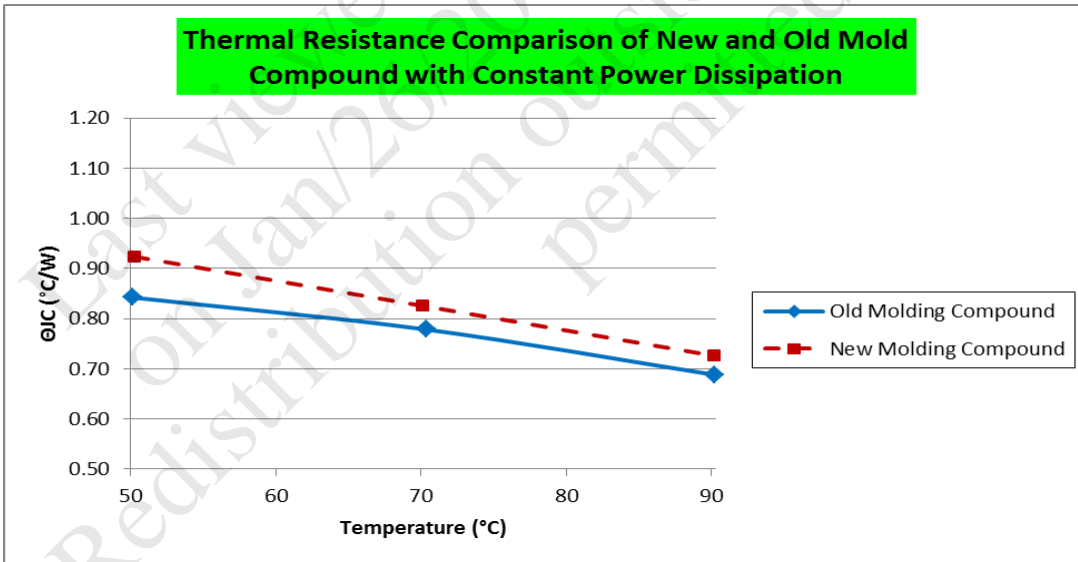


Chart 4: Thermal Resistance of New and Old Mold Compound with Constant Power Dissipation



Section II: Product Qualification of VI Chip Packages to MSL 4

New Mold Compound Qualification Summary

The new mold compound was evaluated on models representing designs and physical materials used in the PRM, VTM, and BCM product families. These products meet the following reliability test requirements:

- MSL 4 3X245°C reflow conditioning
- 1,000 temperature cycles from -55°C to 125°C
- 1,000 hours at 125°C
- 1,000 hours at -65°C
- 1,000 hours of temperature-humidity bias

Details of MSL 4 Reflow Testing

MSL 4 245°C Qualification Process Steps:

1. Units baked at 125°C for 24 hours.
2. Condition per J-STD-020D.1 using standard soak conditions of 96 hours at 30°C/60% RH.
3. Reflow 3 times using profile per J-STD-020D.1 (See Chart 5 below)
4. Post-stress full functional electrical verification (Final ATE Test Conditions)

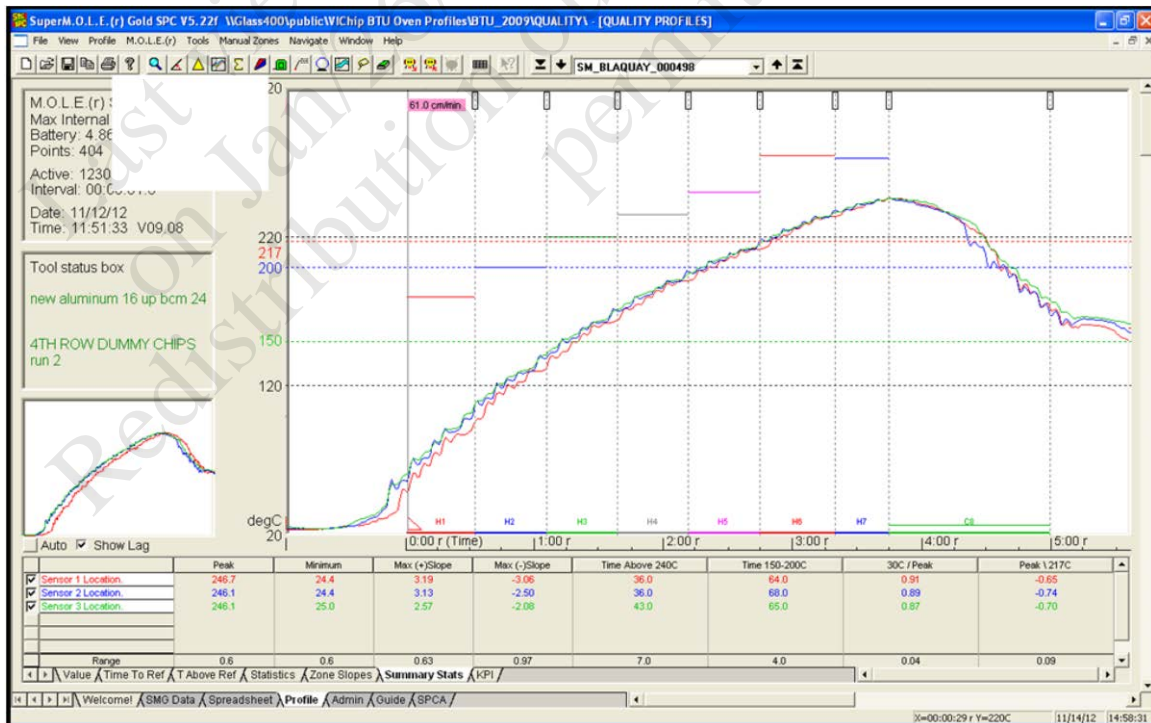


Chart 5: MSL Reflow Profile with 245°C Peak



Conclusion

Based on Vicor's successful MSL4 245°C reflow testing of the product lines, supporting reliability testing, and material characterization, all Full and Half VI Chip products have been qualified to MSL4 245°C with the use of the new mold compound material. Product electrical performance and reliability are not affected by this material change, allowing customers to continue to experience very high long-term field performance with Vicor's VI Chip products.

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MSL 4 Upgrade to VI Chips

- › **Products will be upgraded to MSL 4 on July 6, 2015**
 - Affects HALF and FULL sized VI Chips
- › **No change to form, fit, or functionality**
- › **Refer to PCN document for details**
- › **Packaging Report available**
 - Can be shared with customers
- › **Detailed qualification results available by request**
 - NDA will be required

AFFECTED MPNs

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