
Storage and Shelf Life of Microsemi FPGAs in Plastic Packages

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Introduction

Microsemi SoC Products Group has adopted a policy that FPGAs in plastic packages can be shipped to customers up to 4 years from the date code mentioned on the packaged devices. These FPGAs are comparable to devices with a newer date code when stored properly.

This document describes the industry practice for shelf life of devices in plastic packages. It also intends to address the typical questions and concerns of the end users regarding the condition of the devices with up to 4 years old by describing the packing and storing procedure by Microsemi SoC Corporation, and by providing recommendations on what to check at the customer's incoming inspection.

References

- NEDA Publication: Managing Date Code Restrictions on Orders for Electronic Components, An Industry Position Paper at:
<http://www.ecianow.org/wp-content/uploads/White-Paper-Date-Code-NEDA-MASTER.pdf>
- Joint IPC/JEDEC Standard J-STD-033, Standard for Handling, Packing, Shipping, and Use of Moisture/Reflow Sensitive Surface-Mount Devices at:
<http://www.jedec.org/standards-documents/results/J-STD-033>
- JEDEC Publication, JEP160: Long-Term Storage for Electronic Solid-State Wafers, Dice, and Devices at:
<http://www.jedec.org/standards-documents/docs/jep160>
- Joint IPC/JEDEC standard J-STD-020, Standard for Moisture/Reflow Sensitivity Classification for Nonhermetic Surface-Mount Devices at:
<http://www.jedec.org/standards-documents/results/J-STD-020>
- Joint IPC/JEDEC standard J-STD-002D, Solderability Tests for Component Leads, Terminations, Lugs, Terminals and Wires at:
<http://www.jedec.org/standards-documents/results/J-STD-002D>

Industry Practices for Device Shelf Life

Many organizations in the electronic industry have adopted a shelf life of 5 or more years for devices with plastic packages.

A reference is available in this document:

<http://www.ecianow.org/wp-content/uploads/White-Paper-Date-Code-NEDA-MASTER.pdf>

Typical End-User Concerns on Devices with an Older Date Code

The primary factor that affects the shelf life of the devices in plastic packages is moisture, which can be absorbed by the units while the device is in storage.

When plastic packages absorb moisture, the moisture could turn to vapor during the board mounting re-flow process. This vapor generates pressure and can cause interfacial delamination within the device.

An extended exposure to moisture might also lead to oxide formation at the terminal plating finish, which can cause solderability failure at the board mounting process.

Solderability Performance of Devices in Plastic Packages in Long Term Storage

Microsemi SoC Products Group Packaging Team conducted an evaluation on MSCC devices with samples up to 5 years old, secured in moisture barrier bag (MBB) and stored in a warehouse environment. Various sets of samples were submitted to the solderability test per JEDEC J-STD-002. With all results showed good solderability response similar to devices with the newer date codes.

Microsemi SoC Packing and Storage Procedure

Packaging materials that Microsemi SoC division uses and the storage procedures are designed to ensure sufficient protection of the components while they are in storage in a warehouse environment.

- The components are stored in a vacuum sealed MBB with desiccant and humidity indicator cards (HIC) in it. The MBB along with the desiccant is designed to protect the units from absorbing moisture for at least two years. If there is a breach in the MBB seal, the HIC indicates it.
- The components are repackaged with the new MBB every two years or prior to component shipment.
- If there are any sign of breach on the MBB as indicated by the HIC, the components in the bag undergo the recertification process that includes solderability test on the representative units. The entire lot also undergoes dry baking process prior to vacuum seal bake to a new MBB with the new desiccant and HIC.

Recommended Incoming Inspection Practices for Microsemi Customers

Microsemi Customers are encouraged to follow these common industry practices:

- Inspection: Conduct inspection to ensure that the MBB has retained the vacuum seal and that there is no sign of breach. Also, after opening the MBB, check the HIC for any sign of moisture exposure. If there is no sign of moisture, the units are in good condition.
- Dry bake: If there is any indication of moisture exposure, the product should be baked per JEDEC J-STD-033 to remove moisture.
- If the devices are stored at customer side, repeat the inspection above. If there is any sign of MBB breach, the solderability of the terminals might be affected. So, Microsemi recommends to send a representative sample for solderability testing. The JEDEC J-STD-002D defines the procedure for the solderability test of the terminals.

Conclusion and Recommendation

In general, with proper storage of devices, the quality and reliability of the devices are comparable to a newer product. The best indicator of the device condition and quality is not the date code, but the dry bag seal date shown on the label sticker attached to the MBB, and the HIC inside the MBB.

Industry experience and the internal evaluation of Microsemi SoC Corporation show a good shelf life of plastic packages with proper storage.



Microsemi Corporate Headquarters
One Enterprise, Aliso Viejo,
CA 92656 USA

Within the USA: +1 (800) 713-4113
Outside the USA: +1 (949) 380-6100
Sales: +1 (949) 380-6136
Fax: +1 (949) 215-4996

E-mail: sales.support@microsemi.com

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