

Long Term Storage of Packaged Semiconductor IC Products

AN201106 provides information on long-term storage of packaged semiconductor IC products.

1 Introduction

The occasion might arise in which a customer has a packaged Semiconductor IC product that will be, or has been in storage in excess of 12-18 months. This document provides some information to help our customers make more informed decisions on how best to store these products and what issues might arise. Also see [Section 7, Frequently Asked Questions on page 3](#) for more details.

2 General

Receiving, storing, packing, and shipping procedures should prevent mechanical or electrical damage or degradation of the Semiconductor IC device when subjected to normal handling, shipping, and storage. All packing materials should be either conductive or antistatic, including tubes, trays, reels, bags, and fillers (see [EIA-583](#)). Appropriate ESD precautions must be taken (see [JESD625](#)). Dry bagging or vacuum bagging of product at any point up to and including shipment to the end user should follow industry standard specifications. This includes rebaking and rebagging of parts when necessary. The distributor or user is responsible for verifying conformance to all of the receiving, storing, packing, and shipping requirements prior to use by the end customer.

3 Inventory Control

When several lots of the same part number and package type exist in inventory, product should be used based upon the first-in, first-out (FIFO) inventory method (i.e., delivery or use based upon the oldest date code first).

4 Main Concerns

4.1 Moisture Barrier Bag Penetration

It is possible that while in storage, moisture might have permeated the sealed moisture barrier bag (MBB) that encloses the product and protects it from moisture. If, after opening the MBB, the humidity indicator card has changed color showing that moisture has penetrated the MBB and bake is required, the parts must be baked per the recommended conditions shown on the label adhered at the MBB bag before they are used. If possible, the baked parts should be placed in a sealed bag as well before use.

4.2 Oxidation/Discoloration on Leadframe-based Packages

In rare instances, while in extended storage, the leads on leadframe-based packages such as TSOP or SOIC products might discolor and/or oxidize. Cleaning fluxes should be employed to ensure proper cleaning and best adhesion to the board. Solderability testing should be performed in order to ensure good solder wetting. SkyHigh also recommends a limited trial-run or assembly evaluation to guarantee favorable results before the product is placed into mass-production.

4.3 Oxidation/Discoloration on Substrate-based Packages (BGA)

In the same way that leadframe-based packages can oxidize and/or discolor, in rare circumstances the solder spheres attached to the underside of substrate-based packages might also discolor and/or oxidize. As with leadframe packages, BGA packages should be treated in a similar fashion to ensure good results with assembly.

4.4 **Difficulty with Packaged Parts Shipped in Tape and Reel**

When packaged parts are shipped in tape and reel, it is more difficult to ensure long term reliability because of the nature of the transport medium. Tape and reels, although packaged in a moisture barrier bag, might still experience some moisture ingress, and as a result, the parts inside might need to be baked. However, reels cannot withstand the higher temperatures required for dry bake, and the parts must be placed into trays, which can withstand baking temperatures. For very long term storage, it is recommended that products be purchased in trays so that any necessary bake can be performed easily.

4.5 **ESDS Considerations**

The system for electrostatic discharge sensitive (ESDS) protection should be in compliance with JESD625. When removing devices from reels, the cover tape should be removed at a rate of 10 mm/second or less, and at an angle of between 165° and 180° from the carrier tape to minimize electrostatic generation.

5 **Conclusion**

In general, the quality and reliability of long term stored Semiconductor IC product should be acceptable and comparable to newer product. However, to ensure that no issue will be observed in assembly (board mounting), SkyHigh recommends an evaluation of long term stored product before mass production is initiated.

6 **References**

- Joint IPC/JEDEC Standard J-STD-020, *Moisture/Reflow Sensitivity Classification for Nonhermetic Solid-State Surface-Mount Devices*
- Joint IPC/JEDEC Standard J-STD-033, *Standard for Handling, Packing, Shipping, and Use of Moisture/Reflow-Sensitive Surface-Mount Devices*
- JEDEC Standard JESD31, *General Requirements for Distributors of Commercial and Military Semiconductor Devices*
- JEDEC Standard JESD625, *Requirements for Handling Electrostatic-Discharge-Sensitive (ESDS) Devices*
- EIA Standard EIA-541, *Packaging Material Standards for ESD-Sensitive Items*
- EIA Standard EIA-583, *Packaging Material Standards for Moisture-Sensitive Items*

7 Frequently Asked Questions

Q: I have SkyHigh product that has been in storage for an extended amount of time. What should I do to ensure that the parts would work in my application?

A: Examination of the vacuum sealed bag and Humidity Indicator Card must first be done to determine if moisture has penetrated the barrier bag. Additionally, preliminary testing such as solderability and a limited trial run with the old material is recommended.

Q: What kinds of indication will I have if there is a risk for this older material?

A: It is possible for an issue to arise even if there is no visual indication of a problem. However, solder leads can appear tarnished or even copper in color as opposed to the normal silvery appearance. Solder spheres can also appear tarnished which might indicate a concern. But with proper testing performed up front, any potential for risk can be minimized.

Q: What are SkyHigh's storage recommendations?

A: SkyHigh always recommends that packaged parts be kept in an environmentally controlled area (<40°C and 90% RH), as indicated on the label adhered to the MBB bag, and in proper containers and vacuum sealed, if possible. Because most SkyHigh parts have a warranty for 12 months, product that exceeds that time frame will have limited support. However, SkyHigh is dedicated to its customers and will work to help assist in any way possible.

Q: What kind of reliability issues should I expect from these parts?

A: The functionality and reliability of the product should be unaffected. However, it is possible that because of moisture ingress and subsequent corrosion or contamination, package leads or solder spheres might not fully wet to the solder paste, resulting in unformed or incomplete bonds to the printed wiring board. This is why SkyHigh recommends solderability testing and a board mounting evaluation prior to full production.

Document History Page

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*A	5008916	MSWI	11/10/2015	Updated in Cypress template
*B	5822990	AESATMP8	07/18/2017	Updated logo and Copyright.
*C		MNAD	06/04/2019	Updated to SkyHigh format.