



## **Handling Guidelines for Moisture Sensitive Plastic Surface Mount Components**

**NIGP 105.00**

**SEPTEMBER 1993**

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Superseded by JEP 124

# Handling Guidelines for Moisture Sensitive Plastic Surface Mount Components

## 1.0 Purpose

The purpose of this guideline is to establish procedures for the proper handling, storage, and repacking of moisture sensitive Plastic Surface Mount Components.

## 2.0 Scope

This guideline applies to all distributors who handle moisture sensitive Plastic Surface Mount Components.

## 3.0 Reference Documents

ANSI/EIA-583 "Packaging Material Standards for Moisture Sensitive Items "

ANSI/IPC-SM-786 "Recommended Procedures for Handling of Moisture Sensitive Plastic IC Packages"

JEP113 "Symbol and Labels for Moisture Sensitive Devices"

ANSI/EIA 108 "Distributor Requirements for Handling ESD Devices"

## 4.0 Background

Select Plastic Surface Mount Components are susceptible to package cracking as well as other moisture induced failure mechanisms when exposed to the high thermal stresses associated with surface mount processing. To ensure the package integrity of moisture sensitive components during surface mount processing, suppliers package these devices in moisture barrier bags with a desiccant material and humidity indicator card and clearly mark the intermediate box with a tear drop label. If proper handling procedures are followed, the dry pack packaging provides a minimum shelf life of 12 months from the seal date. Appropriate ESD handling procedures must be followed when handling or storing moisture sensitive Plastic Surface Mount Components.

## 5.0 Materials

### 5.1 Moisture Barrier Bags

The protective moisture barrier bag must meet MIL-B-81705C, Type I requirements for flexibility, electrostatic discharge protection, mechanical strength, and puncture resistance. The bags should not exhibit contact corrosiveness. Type I bags are opaque and generally of multilayer construction. The bags must be heat sealable. The Water Vapor Transmission Rate (WVTR) of the bag must be less than 0.02 grams/100square inches/24 hours. The storage life of bagged components will be determined by the properties of the bag material and the amount of desiccant used.

### 5.2 Desiccant

The desiccant material must meet MIL-D-3464, Type II requirements. It must be dustless and non-corrosive and absorbent to the amounts specified in the standard. Desiccant material is available in fractional or whole units where a unit is the quantity of desiccant required to absorb a minimum of 2.85 grams of water vapor at 20% relative humidity at a temperature of 25°C. The amount of desiccant to be used in a moisture barrier bag is outlined in the Section 7.0 of this guideline.

### 5.3 Humidity Indicator Card

A humidity indicator card must be placed inside the moisture barrier bag to serve as an aid in determining the exposure level of the contents to moisture. The humidity indicator card must comply with MIL-I-8835A and MIL-P-116, Method II. The number of dots and their resolution must conform to the requirements outlined in ANSI/IPC-SM-786.

### 5.4 Labels

Two labels are required for the packaging of moisture sensitive integrated circuits; an ID Label and a Caution Label. The ID Label should be a minimum of three-fourths inches in diameter with a black symbol and letters on a blue background. The Caution Label should be a minimum of three inches square with blue symbols and letters on a white background. Refer to JEP113 for the specific language and color to be used for each label.

## 6.0 Procedure

### 6.1 Incoming Inspection

The distributor will receive moisture sensitive Plastic Surface Mount Components in sealed moisture barrier bags packed with desiccant material and a humidity indicator card. A tear drop ID Label will be affixed to the intermediate box or package near the Product Package Label to ensure the proper handling and storage of the moisture protected product. Upon receipt, inspect the intermediate box to ensure that it is not damaged. If damaged, remove the moisture barrier bag and inspect it for holes, tears or punctures that would expose either the contents or inner layer of the moisture barrier bag. If the bag is damaged, disposition the product per your normal incoming receiving procedures for non-conforming material.

### 6.2 Opening Moisture Barrier Bags

If it is necessary to open the bag, simply cut across the top of the bag as close to the original seal as possible being careful not to damage the contents. By cutting close to the seal, the maximum amount of bag length is preserved for resealing. Once the bag is open, the humidity indicator card should be checked to ensure that it has not expired.

**Note: If the 20% dot on the humidity indicator card is pink and the 30% dot is not blue, the components have been exposed to a level of moisture beyond that recommended. The product must be rebaked and repacked in a moisture barrier bag with new desiccant and a new humidity indicator card. Contact the supplier to determine a mutually agreeable disposition for the product.**

### 6.3 Resealing the Original Bag

After removal of the components to be repacked from the original bag, reseal the remaining product in the original bag with the original desiccant and humidity indicator card.

Partially or lightly evacuate the bag to reduce packaging bulk and heat seal the bag as close to the end as possible following the heat sealing equipment manufacturers guidelines. The bag should not be completely evacuated since this will reduce the effectiveness of the desiccant and possibly damage the contents.

### 6.3 Resealing the Original Bag (Cont.)

Inspect the quality of the bag seal and the condition of the bag to ensure that the seal is complete and that there are no holes or punctures in the bag.

**Note: It is recommended that the resealing be accomplished within 10 minutes of the opening of the original bag to minimize the exposure time of the components to moisture. The cumulative out of bag time for the components must not exceed 0.5 hours at 30°C/60% relative humidity (as specified in ANSI/IPC-SM-786). If exceeded, the allowable floor life specified by the manufacturer must be adjusted accordingly.**

### 6.4 Preparing the Components for Shipment

Place the components to be shipped in a moisture barrier bag with the correct number of units of desiccant (as specified in Section 7.0 of this guideline) and a humidity indicator card. The humidity indicator card should read 10% relative humidity or less.

Partially or lightly evacuate the bag to reduce packaging bulk and heat seal the bag as close to the end as possible following the heat sealing equipment manufacturers guidelines. The bag should not be completely evacuated since this will reduce the effectiveness of the desiccant and possibly damage the contents.

Inspect the quality of the bag seal and the condition of the bag to ensure that the seal is complete and that there are no holes or punctures in the bag.

**Note: It is recommended that the components be sealed in the new bag within 10 minutes of the opening of the original bag to minimize the exposure time of the components to moisture. The cumulative out of bag time for the components must not exceed 0.5 hours at 30°C/60% relative humidity (as specified in ANSI/IPC-SM-786). If exceeded, the allowable floor life Specified by the manufacturer must be adjusted accordingly.**

### 6.4 Preparing the Components for Shipment (Cont.)

Using the suppliers recommended floor life guideline, fill in Section 2a of the Caution Label noting any required adjustments for exposure times in excess of 0.5 hours. For example, if the manufacturers recommended floor life is 48 hours and the components were out of the bag for three hours in the programming center, then an adjusted floor life of 45 hours should be written in Section 2a of the Caution Label. Note the current date in the Bag Seal Date section of the label using "MMDDYY", "YYWW", or equivalent format and place the Caution Label on the exterior of the moisture barrier bag near or on the same side as other labels that may be on the bag. Do not place the label over the seal area. Place the bag in an intermediate box or package and place a moisture sensitive ID Label on the same end of the box as the Product Package Label.

## 7.0 **Desiccant Formula**

The amount of desiccant used per moisture barrier bag is based on the bag surface area and water vapor transmission rate in order to maintain an interior relative humidity of less than 20% at 30°C.

The following formula can be used to calculate the correct amount of desiccant to include in the moisture barrier bag.

$$U = 30.4 \times C \times A \times R \times m \times DRF/B$$

where, U = number of desiccant units where a unit is the quantity of desiccant required to absorb a minimum of 2.85 grams of water vapor at 20% relative humidity at a temperature of 25°C.

30.4 = average number of days per month

C = 0.01 area constant

A = interior surface area of the moisture barrier bag (in <sup>2</sup>)

R = water vapor transmission rate of the moisture barrier bag (grams/100square inches/24 hours)

M = maximum storage time (normally 12 months)

DRF = desiccant reduction factor (0.38 at 30°C/60% relative humidity)

B = minimum moisture capacity of the desiccant at 20% relative humidity ( normally 2.85 grams )

Typical desiccant quantities for various bag sizes where R = 0.02 grams/100square inches/24 hours, M = 12 months, DRF = 0.38, and B = 2.85 is outlined in Table 1.

Please note that these values are presented as an example only and must be adjusted for different types of bags and desiccant.



## 7.0 Desiccant Formula (Cont.)

Additional desiccant may be required if dunnage materials are used inside the moisture barrier bag. Additional desiccant should be added at a rate of 8 units per pound of cellulose and 0.5 units per pound of synthetic dunnage.

## 8.0 Desiccant Storage

Desiccant can be stored in the original container provided that the container is immediately resealed after each use. Prior to resealing the container, a 10% relative humidity indicator card should be placed inside, if one is not already present. If during a subsequent opening of the container the indicator card shows the moisture of the contents to be higher than 10%, the desiccant should be scrapped or rebaked following the manufacturers guidelines.

**Table 1**  
(Example only based on assumptions listed below)

| Bag Width<br>(Inches) | Bag Length<br>(Inches) | Bag Area<br>(Square Inches) | Desiccant<br>Calculation | # Units<br>Desiccant |
|-----------------------|------------------------|-----------------------------|--------------------------|----------------------|
| 2                     | 4                      | 12                          | 0.12                     | 1                    |
| 4                     | 4                      | 24                          | 0.23                     | 1                    |
| 4                     | 8                      | 56                          | 0.54                     | 1                    |
| 6                     | 6                      | 60                          | 0.58                     | 1                    |
| 6                     | 10                     | 108                         | 1.05                     | 2                    |
| 8                     | 8                      | 112                         | 1.09                     | 2                    |
| 8                     | 12                     | 176                         | 1.71                     | 2                    |
| 10                    | 10                     | 180                         | 1.75                     | 2                    |
| 10                    | 14                     | 260                         | 2.53                     | 3                    |
| 10                    | 24                     | 460                         | 4.47                     | 5                    |
| 12                    | 16                     | 360                         | 3.50                     | 4                    |
| 14                    | 14                     | 364                         | 3.54                     | 4                    |
| 14                    | 18                     | 476                         | 4.63                     | 5                    |
| 16                    | 16                     | 480                         | 4.67                     | 5                    |
| 16                    | 18                     | 544                         | 5.29                     | 6                    |

Assumptions:

Water Vapor Transmission Rate = 0.02 grams/100square inches/24 hours

Storage Time = 12 months

Desiccant Reduction Factor = 0.38 at 30°C/60% relative humidity

Moisture Capacity of Desiccant = 2.85 grams

Bag Area = 2 x Width x (Length - 1 Inch)