The Moisture Sensitive Device Handling Specialists

Moisture Barrier Bags
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1. Overview

- The need to keep components dry between the time of manufacture and the point of reflow soldering led to the development of Moisture Barrier Bags.

- Sometimes called Vapor Barrier Bags, they are made from multiple layers of plastic and aluminium that control moisture vapor leakage.

- It’s also a protective packaging process that can prevent oxidation.

- MBBs are increasingly used to pack other goods or moisture sensitive assemblies/devices for long term (up to 1 year) storage and transport.
2. MBBs
2. MBBs

Quality of bags:

- MIL-B 81705-REV-C (Puncture resistance, gas transmission, ESD, etc.)
- 4 layers, 150 μm
- Water vapor transmission rate: 0.0006 g/100 inch²/day
- ESD safe

**SPECIFICATION**

<table>
<thead>
<tr>
<th>Physical Properties</th>
<th>Unit</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Structure</td>
<td></td>
<td>ESD-PE-AL/ONY/PE-ESD</td>
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<tr>
<td>Thickness</td>
<td>Mil(micron)</td>
<td>6.0 Mil.(155μ)+/-10%</td>
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<tr>
<td>Tensile Strength (ASTM D882-91 Method A)</td>
<td>psi</td>
<td>MD:10500</td>
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<tr>
<td>Tear Strength (ASTM D1004-66 Method A)</td>
<td>lbs</td>
<td>MD:37.02</td>
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<td>Elongation (ASTM D882-91 Method A)</td>
<td>%</td>
<td>MD:125</td>
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<td>Light Transmission (ASTM D-1003-92)</td>
<td>%</td>
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<tr>
<td>Heat Seal Strength (FTMS D 1876-93)</td>
<td>lbs./in.width</td>
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<td>Burst Strength (FTM 191-C Method 5122)</td>
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<tr>
<td>Puncture Strength (FTMS 101-C Method 2065-1)</td>
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<td>&gt;197.66</td>
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<td>MVTR</td>
<td>gms</td>
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<td>EMI Shielding (Mil-B 81705-REV-C)</td>
<td>DB</td>
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<td>Capacitive Probe Test (High Voltage Discharge) (EIA-Std541/Appendix E-1KV)</td>
<td>Volts</td>
<td>&lt;15</td>
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<td>Surface Resistivity (ASTM) D257@15%R.H.</td>
<td>ohms/sq.in</td>
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<td>Interior</td>
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<td>Exterior</td>
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<tr>
<td>Metal</td>
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<td>10^4-4</td>
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<tr>
<td>Static Decay (FTM 101C Method 4046-1, 5000V to 0 Volts)</td>
<td>ohms sec.</td>
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2. MBBs

**Standard sizes**

- 100 x 660 mm
- 250 x 500 mm
- 420 x 440 mm
- 420 x 540 mm
3. Desiccant

What is Desiccant?

- Desiccant is a drying agent that is used to absorb residual moisture from the air inside moisture barrier bags.
- Entirely different type desiccant than used in Cabinets
- Desiccant absorbs moisture vapor (humidity) from the air left inside the barrier bag after it has been sealed. Any moisture that penetrates the bag will also be absorbed. Desiccant remains dry to the touch even when it is fully saturated with moisture vapor.

- Dust-free
- Non corrosive
- Special ESD coating < 1012 Ohms (dissipative)
- Packaging: 1 unit = 100p & ½ unit = 250p (MIL/JEDEC spec)
- Storage in a dry atmosphere
- Can be reactivated at 120°C during 16 hours
4. HIC

What is an HIC?

- An HIC (Humidity Indicator Card) indicates the relative humidity with moisture-sensitive, color changing chemical spots.
- HICs provide assurance to the user that the devices are dry when received.
- Range: 5% RH, 10% RH and 60% RH
- Packaging: 125p per pint can
- Storage: keep in a dry area away from sunlight under normal temperature (10 to 40°C)
5. MSL Label

Moisture Sensitive Identification

- Labels relevant to the dry pack process are the “Moisture-Sensitive Identification” (MSID) label and the Caution label as specified in JEDEC JEP113 shall be affixed to the lowest-level shipping container that contains the MBB.

- The Caution label shall be affixed to the outside surface of the MBB. The Caution label includes fields for the peak package body temperature allowed during reflow soldering (the classification temperature per J-STD-020), the floor life, and the bag seal date.

- This label is pre-printed on Super Dry MBBS.

Caution
This Bag Contains MOISTURE-SENSITIVE DEVICES

1. Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)

2. Peak package body temperature: ____________ °C
   If blank, see adjacent bar code label

3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be
   a) Mounted within: ____________ hours of factory conditions
      If blank, see adjacent bar code label
      ≤30°C/60% RH, or
   b) Stored per J-STD-033

4. Devices require bake, before mounting, if:
   a) Humidity indicator Card reads >10% for level 2a - 5a
      devices or >60% for level 2 devices when read at 23 ± 5°C
   b) 3a or 3b are not met

5. If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure

Bag Seal Date: ____________
If blank, see adjacent bar code label

Note: Level and body temperature defined by IPC/JEDEC J-STD-020
6. MVTR

• Moisture Vapor Transmission Rate

• The rate at which water vapor passes through a specific area of barrier material. As MVTR is reduced, dry storage time is increased and desiccant loading is reduced.

• MVTR is measured in grams of water per 100 square inches of barrier per 24 hours ( gms / 100in² / 24 hours)

• Reference Standards:
  • IPC/Jedec J STD 033 (electronic application)
  • EIA 583 for storage with a known humidity level
  • MIL P116 General application

• Calculation of desiccant to be included is required
How much desiccant do I need?

IPC/JEDEC J-STD-033

- Application: Dry packaging for SMD’s.
- What you need to know: Bag size, Bag MVTR, Storage time in months, desiccant capacity at 10%RH & 25°C.
- Formula: Units = \( \frac{0.304 \times \text{Months} \times \text{Bag MVTR} \times \text{Bag Area}}{\text{Moisture Capacity}} \)
- Example: 10” x 20” inch Barrier Bag, with a 0.0006 MVTR and a 12 month storage time. Find Bag Area: 10” x 20” x 2 sides = 400 inches\(^2\).
- Apply Formula: Units = \( \frac{0.304 \times 400 \text{ in}^2 \times 0.0006 \text{ MVTR} \times 12 \text{ months}}{2.9 \text{ g/unit}} \)
  - Units = 0.3 : use 1/2 unit of Desiccant.

When the desiccant capacity at 10% RH and 25°C is not known the quantity needed can be estimated using the following simplified equation. \( U = 5 \times 10^{-3} \times A \)
- \( U \) = Amount of desiccant in UNITS
- \( A \) = Total exposed surface area of the MBB in square inches
How much desiccant do I need?

**EIA 583**

- **Application:** Dry packaging for SMD’s. Allows adjustment of environmental conditions
- **What you need to know:** Bag Area, Bag MVTR, Months of Storage, Maximum Interior Humidity (MIH).
- **Formula:** Units = 0.231 x Bag Area x Bag MVTR x Months / Moisture Capacity
- **Example:** 10” x 20” inch Barrier Bag, with a 0.02 MVTR, a 12 month storage time, and a MIH of 20%.
- **Find bag area:** 10” x 20” x 2 sides = 400 in²
- **Select Moisture Capacity based on MIH:**
  - 10% MIH : 3.0 g/unit
  - 20% MIH : 4.8 g/unit
  - 30% MIH : 5.8 g/unit
  - 40% MIH : 6.2 g/unit
- **Apply Formula:** Units = (0.231 x 400 in2 x 0.02 MVTR x 12 months) / 4.8 g/unit

  **Units = 4.62 units : Use more than 4.5 units of desiccant.**

EIA 583
How much desiccant do I need?

MIL-P-116

- Application: General dry packaging.
- What you need to know: Bag Size
- Formula: Units = 0.011 x Bag Area in square inches.
- Example: 10” x 20” inch Barrier Bag
- Find bag area: 10” x 20” x 2 sides =400 in².
- Apply Formula: Units = 0.011 x 400 in² = 4.4

- Use 4.5 Units of desiccant.
7. Comparative measures

Items to consider when selecting a moisture barrier bag

- Very good MVTR (0.0006 g/100 sq inch /day)
  - The lower the MVTR the longer we can store the product and less desiccant we have to use
- Very good mechanical resistance (155µ )
- Purchase price
- ESD safe
- MSL label (JEP113) printed on the bag
- Additional flap length for reuse
Questions?

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