

---

# Integrated Circuit packing and storage

Raspberry Pi Ltd

2023-02-10: githash: c65fe9c-clean

# Colophon

2020-2023 Raspberry Pi Ltd (formerly Raspberry Pi (Trading) Ltd.)

This documentation is licensed under a Creative Commons [Attribution-NoDerivatives 4.0 International](#) (CC BY-ND 4.0) licence.

build-date: 2023-02-10

build-version: githash: c65fe9c-clean

## Legal Disclaimer Notice

TECHNICAL AND RELIABILITY DATA FOR RASPBERRY PI PRODUCTS (INCLUDING DATASHEETS) AS MODIFIED FROM TIME TO TIME ("RESOURCES") ARE PROVIDED BY RASPBERRY PI LTD ("RPL") "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW IN NO EVENT SHALL RPL BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THE RESOURCES, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

RPL reserves the right to make any enhancements, improvements, corrections or any other modifications to the RESOURCES or any products described in them at any time and without further notice.

The RESOURCES are intended for skilled users with suitable levels of design knowledge. Users are solely responsible for their selection and use of the RESOURCES and any application of the products described in them. User agrees to indemnify and hold RPL harmless against all liabilities, costs, damages or other losses arising out of their use of the RESOURCES.

RPL grants users permission to use the RESOURCES solely in conjunction with the Raspberry Pi products. All other use of the RESOURCES is prohibited. No licence is granted to any other RPL or other third party intellectual property right.

HIGH RISK ACTIVITIES. Raspberry Pi products are not designed, manufactured or intended for use in hazardous environments requiring fail safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, weapons systems or safety-critical applications (including life support systems and other medical devices), in which the failure of the products could lead directly to death, personal injury or severe physical or environmental damage ("High Risk Activities"). RPL specifically disclaims any express or implied warranty of fitness for High Risk Activities and accepts no liability for use or inclusions of Raspberry Pi products in High Risk Activities.

Raspberry Pi products are provided subject to RPL's [Standard Terms](#). RPL's provision of the RESOURCES does not expand or otherwise modify RPL's [Standard Terms](#) including but not limited to the disclaimers and warranties expressed in them.

## Document version history

Release	Date	Description
1.0	15 Oct 2022	<ul style="list-style-type: none"><li>• Initial release</li></ul>

## Scope of document

This document applies to the following Raspberry Pi products:

Raspberry Pi Ltd Integrated Circuits only

# Introduction

This document outlines the packing procedure and storage recommendations for all discrete Raspberry Pi Ltd integrated circuits.

Raspberry Pi Ltd draws on the widely accepted JEDEC (Joint Electron Device Engineering Council) Solid State Technology Association standards.

One of JEDEC's standards, MSL (Moisture Sensitivity Level), classifies the moisture sensitivity of an electronic component. The MSL classification for a Raspberry Pi Ltd device can be found in that device's product databook.

Currently only two MSL classifications apply to discrete Raspberry Pi Ltd products: MSL1 and MSL3.

# MSL overview

The MSL classification is an indication of the ability of the device package to withstand moisture ingress. MSL1-classified products have the most resistance, while products classified at higher levels have increasing less resistance.

Raspberry Pi Ltd products undergo tests defined by JEDEC standard J-STD-020E to qualify the device to a given MSL classification.

Moisture held in the package is particularly important prior to board assembly, because interaction with heat and stress from reflow soldering can result in device damage or degradation. It is possible to expel moisture from the package using a predefined baking procedure; however, the aim of this packing and storage procedure is to avoid the need for any re-bake.

JEDEC defines maximum out-of-bag exposure times for devices, the duration differing by MSL classification. The exposure time is divided into two parts: one is for the manufacturer (Manufacturer's Exposure Time, or MET), and the other is the floor life assembly duration. Raspberry Pi Ltd adheres to the maximum MET as devices are packed and sealed for distribution.

# Packing

Whether devices are packed in trays or reels makes little difference, since neither medium provides resistance to moisture. A sealed moisture barrier bag (MBB) is the recognised method for providing protection.

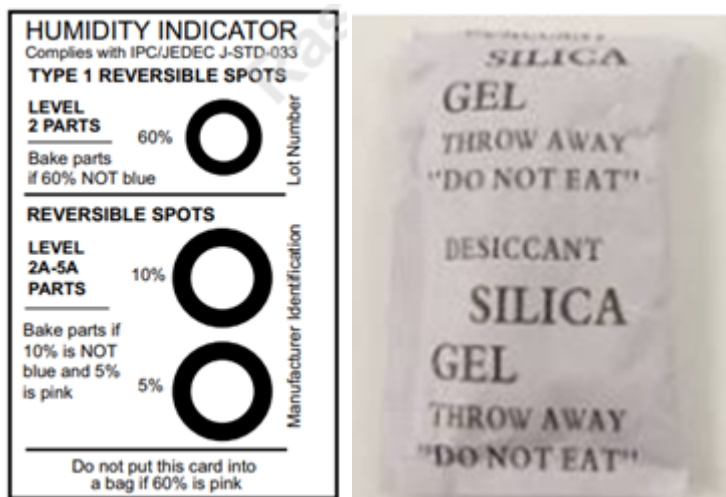
If customer repacking is required, Raspberry Pi Ltd recommends the manufacturing packing procedure defined below.

## Vacuum-sealed MBB

A vacuum-sealed moisture barrier bag is required for MSL3 products as specified in JEDEC standard J-STD-033D. Although not strictly necessary, Raspberry Pi Ltd has elected to seal MSL1 products in a MBB.

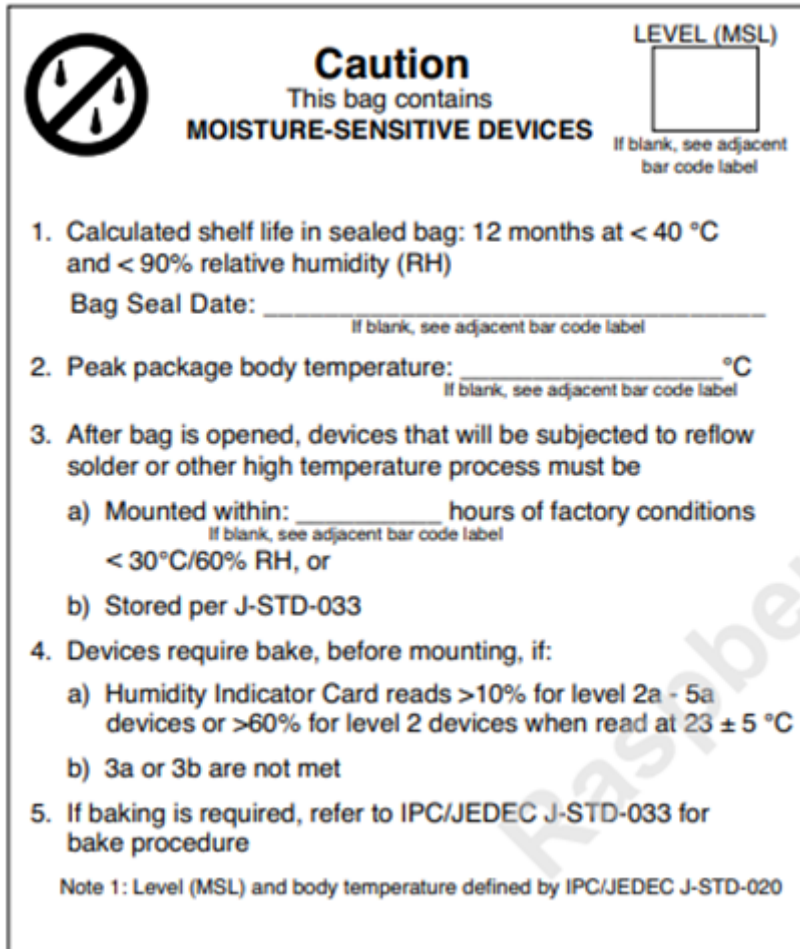
## HIC and desiccant

Both a humidity indicator card (HIC) and desiccant are required for MSL3 products and are included in the MBB contents. They serve no purpose for MSL1 and are therefore omitted for Raspberry Pi Ltd MSL1-classified products.



## Caution label

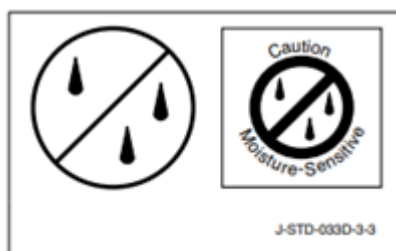
A caution label is included on the outside of the MBB for all moisture-sensitive products. This label identifies the sensitivity level for the product and provides details on floor life conditions and duration.



A caution label is not required for MSL1, but an alternative label is required indicating MSL1.

### MSID label

Another label, the MSID (Moisture Sensitive Identification) label, is included on the packing box, identifying that it has moisture-sensitive contents.



Although MSL1 does have floor life restrictions, an MSL1 product is not considered a moisture-sensitive product and therefore no MSID label should be present.

# Breaking the MBB seal

The 10% spot on the humidity indicator card must remain blue upon opening. Otherwise, the condition of the material is unknown and a bake is required before use.

## Bake conditions

For MSL3 products, an eight-hour bake at  $125^{\circ}\text{C} + 10/-0^{\circ}\text{C} < 5\%$  relative humidity will reset the floor time. Bake time maybe reduced to six hours if exposure time is  $< 72$  hours.



# Storage and handling

Raspberry Pi Ltd recommends product storage in compliance with IPC/JEDEC standard J-STD-033D.

J-STD-033D defines two lifespans: the shelf life for a dry-packed unopened MBB, and floor life for the time between opening and soldering.

## Shelf life

For MSL1 products, the shelf life is considered unlimited <sup>[1]</sup> with storage conditions  $\leq 30^{\circ}\text{C}/85\% \text{RH}$ .

MSL3 products have a twelve-month shelf life when correctly stored  $\leq 40^{\circ}\text{C}/90\% \text{RH}$ .

After the twelve-month period, customer action is recommended on a case-by-case basis. Consider the plan for the material, the state of the humidity indicator card, and the assurance provided by a bake.

## Floor life

Once again, for MSL1 products, the floor life is considered unlimited with conditions  $\leq 30^{\circ}\text{C}/85\% \text{RH}$ .

For MSL3 products, the floor life is critical: it is limited to 168 hours in a controlled environment with  $\leq 30^{\circ}\text{C}/60\% \text{RH}$ .

[1] Other warranty conditions may apply

# Handling

At all times consideration must be given to electrostatic discharge-sensitive (ESDS) devices.

Raspberry Pi Ltd recommends adherence to specification JESD625 for the Handling of Electrostatic Discharge Sensitive devices.



**Raspberry Pi**

Raspberry Pi is a trademark of the Raspberry Pi Foundation

---

**Raspberry Pi Ltd**