

Instructions for storage, repackaging during storage, soldering profiles, and assembly conditions of integrated circuits in plastic packages

1 Assembly Conditions and Storage Requirements

1.1 The material of **BGA package solder balls** is **Sn63Pb37** solder.

1.2 The ICs are suitable for **surface mount technology (SMT)** on printed circuit boards (PCBs) via **group reflow soldering**, provided that the required temperature profile of the solder paste is maintained and the IC mounting area is heated uniformly across its entire surface.

The **maximum soldering temperature** must not exceed the values specified in the **Technical Specifications (TS)**.

1.3 Handling procedures for **moisture-sensitive ICs** (Moisture Sensitivity Level **MSL > 1**) must comply with the requirements outlined below.

1.3.1 The necessity of **pre-assembly baking (thermal treatment)** is determined based on storage conditions and the **MSL** specified in the TS and the IC label.

1.3.2 ICs must be stored in a **hermetically sealed packaging** (moisture-barrier bag) with an enclosed **desiccant**.

1.3.3 After opening the packaging, ICs must be stored in **dry storage cabinets (chambers)** at a controlled temperature of **(25 ± 5) °C** and relative humidity **not exceeding 5%**. Storage time under these conditions is unlimited within the overall shelf life of the ICs.

1.3.4 The handling procedure for ICs is specified in **Table 1**.

MSL Level	Unpacked Storage Time	Max Temperature, °C	Max Humidity, %
1	Unlimited	30	85
2	1 year	30	60
2a	4 weeks	30	60
3	168 hours	30	60
4	72 hours	30	60
5	48 hours	30	60
5a	24 hours	30	60

1.4.5 ICs stored in an **opened package** under production conditions that violate the requirements of clauses 1.3.3 and 1.4.4 must undergo **baking (thermal treatment)** in accordance with the modes specified in **Table 2**.

IC Package Thickness, d (mm)	MSL Level	Baking at 125 °C (hours)	Baking at 90 °C and 5% RH	Baking at 40 °C and 5% RH
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d ≤ 1.5	2	5	17 hours	8 days
	2a	7	23 hours	9 days
	3	9	33 hours	13 days
	4	11	37 hours	15 days
	5	12	41 hours	17 days
	5a	16	54 hours	22 days
d > 1.5	2	18	63 hours	25 days
	2a	21	3 days	29 days
	3	27	4 days	37 days
	4	34	5 days	47 days
	5	40	6 days	57 days
	5a	48	8 days	79 days
BGA Packages	2 - 6	96	Not applicable	Not applicable

- **Baking ICs in blister tapes** is permitted at temperatures **not exceeding 50 °C**.
- When using **lead-free solder pastes**, **baking is mandatory**. It is recommended to perform baking at **125 °C for 24 hours**.

1.4.6 In case of **partial removal of ICs** from the packaging, the remaining components must be **repackaged** according to the instructions provided below.

Upon removing ICs, it is mandatory to verify that storage and transportation conditions have not been breached by checking the enclosed **Humidity Indicator Card (HIC)**.

If **at least one of the indicator circles has turned pink**, the ICs must undergo **baking before assembly**.

1.5 Recommended **solder pastes** based on the heat resistance of the ICs during soldering are listed in **Table 3**.

Heat Resistance During Soldering according to TS (TU), °C	Tin-Lead Solder Pastes	Lead-Free Solder Pastes
255	Allowed	Allowed
225	Allowed	Not allowed

1.6 An example of a **soldering profile** for ICs is specified in **Table 4**.

Parameter	Parameter Value
Maximum Temperature, °C: - when using tin-lead solder paste - when using lead-free solder paste	225 255
Ramp-up (Heating) Rate, °C/s	1.0 to 4.0
Ramp-down (Cooling) Rate, °C/s	2.0 to 4.0
Preheat Temperature, °C	150 ± 10
Preheat Duration, s	60 to 180

Total Time Above Temperature: - above 183 °C (for tin-lead solder paste), s - above 217 °C (for lead-free solder paste), s	60 to 90
Dwell Time at Max Temperature, s	max 10 ± 1

Note – The maximum soldering temperature must not exceed the value specified in the TS. Solder paste selection – see Table 3.

1.7 The **allowed number of rework cycles** (assembly, disassembly, assembly) for ICs in **QFN and DFN packages** is **1 (one)**.

ICs in **BGA packages** are designed for **single-time soldering only**.

During equipment repair and parameter measurement, IC replacement must be carried out **only when power supplies are disconnected**. The package temperature during IC disassembly must not exceed **225 °C**.

Soldering, welding, and assembly tools must not have an electrical potential exceeding **0.3 V relative to the Common (GND) bus**.

1.8 It is recommended to **clean the ICs** using an **alcohol-nefras mixture (1:1)**.

2 Instructions for Repackaging Integrated Circuits

2.1 These instructions apply to ICs remaining in **secondary packaging** after it has been opened and a portion of the ICs has been removed. It serves as a guide for repackaging ICs at the consumer's facility.

Secondary packaging refers to a cardboard box containing trays (pallets) or a reel with ICs in a blister tape, hermetically sealed in antistatic and moisture-barrier bags.

Repackaging operations must be performed after partial extraction of ICs or in case of a color change on the **Humidity Indicator Card (HIC)**.

The **HIC** is a paper card with a chemical reagent that changes color when exposed to moisture. The card features **three spots (5%, 10%, 60%)** that turn from **blue to pink** as the relative humidity inside the sealed antistatic bag increases. If **all spots on the HIC remain blue**, the reuse of silica gel is permitted.

2.2 Repackaging operations must be carried out on a clean horizontal surface. The following materials and tools must be prepared in advance:

- Moisture-barrier metallized antistatic bag;
- Polypropylene strapping tape for packing ICs into trays;
- Vacuum sealer;
- Silica gel (from 12 to 48 g);
- Paper humidity indicator card E133-1 5-10-60% manufactured by CLEAN CONTROL TECH CORPORATION or equivalent.

Note – To avoid inaccurate readings on the HIC, it should be placed into the bag with the ICs immediately before sealing.

Actions for repackaging ICs into trays (pallets):

1. Form a stack of filled trays.
2. Place **one empty tray on top** of the stack.
3. Secure the stack with **polypropylene packing tape** to prevent the trays from shifting against each other.
4. Place the stack of trays into a **metallized antistatic bag** (size 305x406x76 mm or equivalent) along with the HIC and silica gel:
 - **12 g** for a fully loaded stack;
 - **48 g** for a partially loaded stack.

5. Close the bag, gently express the air, and **hermetically heat-seal it**. *Vacuum drawing is not required and is not recommended.*
6. Mark the **repackaging date** on the bag.
7. Place the bag into the cardboard box, put a protective pad on top, and close the box lid.

Actions for repackaging ICs on reels in blister tape:

1. **Secure the end of the blister tape** to prevent the tape from shifting inside the bag.
2. Place the reel into the **original metallized antistatic bag** (in which it was delivered) or an equivalent one, along with the HIC and **48 g of silica gel**.
3. Close the bag, gently express the air, and **hermetically heat-seal it**. *Vacuum drawing is not required and is not recommended.*
4. Mark the **repackaging date** on the bag.
5. Place the bag into the cardboard box, put a protective pad on top, and close the box lid.