NXP POLICY ON SHELF LIFE

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PUBLIC

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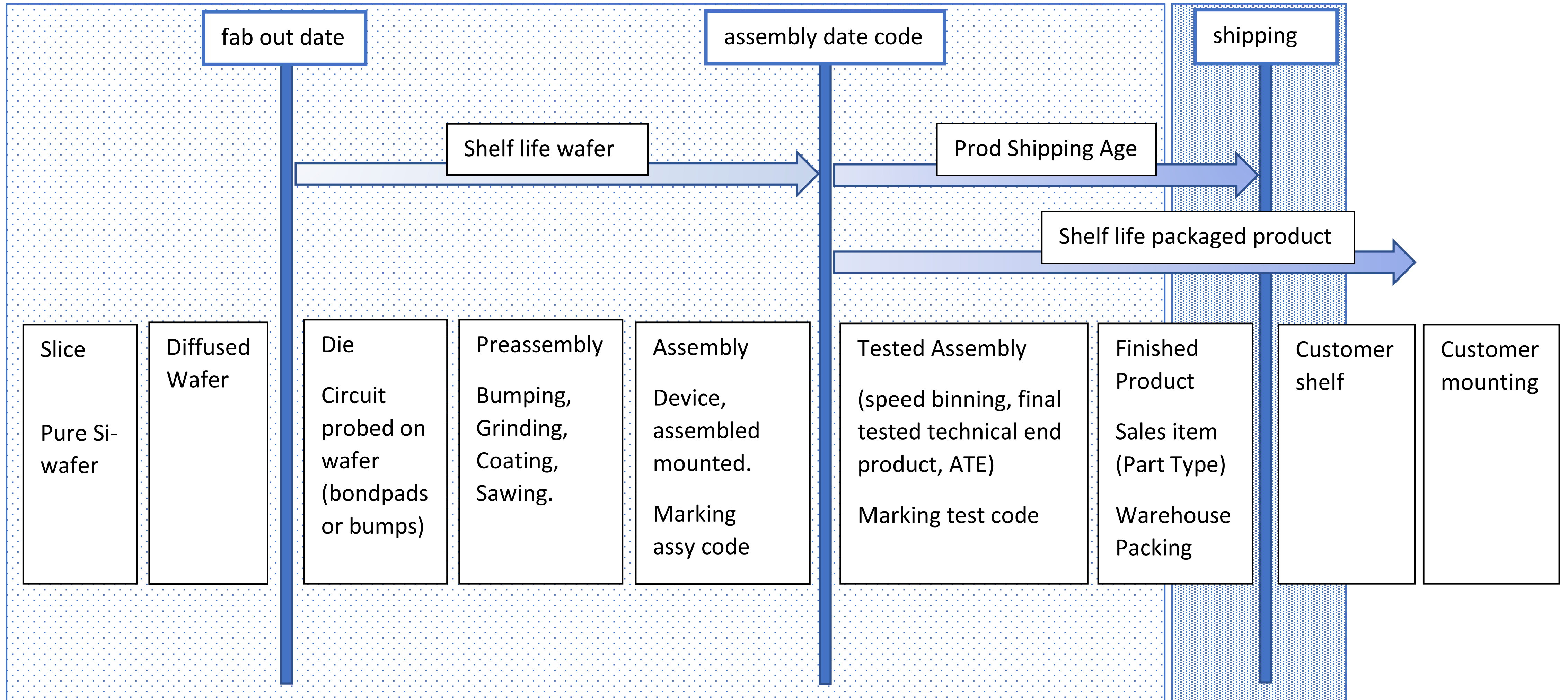
Introduction

This document describes the shelf life and shipping age limits for NXP products including wafers, bare dies, packaged products or modules.

The limits:

- are determined by technical assessments of aging mechanisms and associated risks based on NXP knowledge / experience and industry standards (refer to IEC62435-2/5/6)
- only apply in case products are packed and stored according to NXP internal procedures that are based on industry standards (refer to J-STD-033 and IEC62435-4)

Shelf Life Definitions Picture



Definitions

- Shelf Life of wafers: The time between wafer fab out and start of assembly (at NXP or at the customer).
- Shelf life of packaged products: The time between assembly out and processing at the customer; including the shelf life at the customer.
- Product Shipping Age (PSA): The time between assembly out and shipment to the customer (= shelf life of packaged product within NXP) as standard production material, and without customer special approval. PSA limits are set based on industry practice and company policy.
- Shelf life at the customer: The time between delivery and start of mounting by the customer. For Moisture Sensitive products (MSL ≥ 2), the dry pack seal date is leading in accordance with J-STD-033.
- Floor life at the customer: The time between opening of the Moisture-Barrier Bag (MBB), and start of mounting by the customer. Floor life limits are responsibility of the customer and depend on the indicated moisture sensitivity level of a product.

NXP Shelf Life Limits Modified

- Shelf life of wafers: The maximum time wafers can be stored under appropriate storage conditions is 3 years. Without dry-pack, the storage in N2-cabinets is required in accordance with IEC-62258-3. Processing beyond expiry date requires a risk assessment to evaluate processability, functionality, and reliability for the particular technology and storage conditions.

- Shelf life of packaged products: The maximum time, assembled or bumped products can be stored under appropriate storing conditions and is the sum of the Product Shipping Age limit at NXP and the maximum Shelf life at the customer. Processing beyond expiry date requires a risk assessment to evaluate processability, functionality, and reliability for the particular technology and storage conditions.

- Product Shipping Age Limit: Currently, as before merge, former FSL products generally follow a PSA limit of 5 years and legacy NXP products of 2 years. Work is in progress to align the limits in the manufacturing systems as shown on the next slide.

- Shelf life at the customer: For Moisture Sensitive products (MSL ≥ 2), the dry pack seal date should not exceed 1 year in accordance with J-STD-033 (floor life control is responsibility of the customer).

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Product Shipping Age Limits *

Package Platform	Terminal and Finishing	Package Family	Product Shipping Age Limit
Metal Leadframe Based Carriers	Sn (post plated) NiPdAu NiPdAuAg (pre-plated)	SO, QFP, etc. QFP, QFN, etc. QFN, etc.	5 years 5 years 2 years
Organic Substrate Based Carriers	Solder Balls (any composition) No Bumps / Ni(Pd)Au plated	BGA, etc. LGA, etc.	5 years 5 years
No Carrier/ Bumped Dies	Bare Die or Wafer Au plated Bumps Sn Solder Bumps Cu Pillar Bumps	- Flip Chip Flip Chip, FO WLP, WLCSP Flip Chip	3 years 5 years 2 years 2 years
Card Modules	Ni(Pd)Au	-	1 year

* NXP alignment is in progress

Shelf Life Packaged Products – Aging and Test Methods

Aging	Potential Failure Mode	Test Method	Industry standard
Oxidation of terminals	Solderability issues	Solderability	JESD22-B102 IED 68-2-20 / Test T
Moisture absorption by the products	Popcorn, cracks and severe delamination	Moisture Sensitivity	J-STD-020
Aging of packing materials in direct contact with products	ESD induced damage	Not available	Not Available
Whisker growth	Leakage	Whisker Inspection	JESD201
Internal aging driven by temperature or moisture ingression (incl. data retention)	Corrosion	Temperature/ Humidity Temperature Storage	JESD22-A102/118 JESD22-A103

NXP Warranty

- Warranty
  - NXP warranty begins at date of delivery to customer and can be found at https://www.nxp.com/company/our-company/about-nxp/our-terms-and-conditions-of-commercial-sale:TERMSCONDITIONSSALE
    - Products are warranted for a period of 1 year, dice and wafers for 90 days.
    - Warranty is only valid if products are stored properly, and packing is not damaged.
    - At the moment the dry-pack/ MBB is opened, floor life at the customer starts (in accordance with industry standard J-STD-033. Note: WLCSP are labelled as MSL1 and shipped in dry-pack, floor life is limited to 1 year after opening.

- Certificate of Compliance (CofC)
  - NXP products are shipped with the following Certificate of Compliance statement:

  "NXP certifies that the product supplied conforms to applicable NXP specifications for shipped product. Manufacturing test data and lot traceability records are available for review from NXP upon request."

Frequently Asked Questions

Q: What is the difference between shelf life and the moisture barrier bag (MBB) shelf life?

A: Shelf life is the time between assembly end date at NXP and the assembly at the customer. It is the sum of Product Shipping Age and shelf life at the customer.

MBB shelf life is determined by the dry-packing materials and limited to 1 year; however, if the humidity indicator card (HIC) can be seen through the MBB and indicates low humidity, the MBB shelf time can be prolonged to 2 years, which is utmost date for HIC.

Labels for moisture-sensitive devices typically state per JEDEC J-STD-033 industry standard: “Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)”. This statement reflects the minimum calculated shelf life at severe storage conditions; exceeding the 12-month timeframe does not pose risk as long as the MBB is not compromised and the HIC does not show moisture exposure.

Q: Will all products be packed in MBB?

A: No, per JEDEC J-STD-033 the required storage conditions for products are described.
Products with MSL1 do not need to be packed in moisture barrier bags.

Q: What is the shelf life of Wafer Level Chip Scale Package (WLCSP) products?

A: Wafer Level Chip Scale Packages (WLCSP) are MSL1 and nevertheless packed in MBB to protect the solder balls against oxidization. The Product Shipping Age limit at NXP is 2 years. Customer shelf life is another 1 year in the MBB. After opening of the MBB, WLCSP can be stored another 1 year (floor life) in appropriate storage condition. WLCSP shall not be baked.

In case the shipment of WLCSP is done earlier than the PSA limit of 2 years after the date code, the shelf life at the customer can be longer than 1 year at proper storage conditions (Drypack). All together, mounting at the customer should not exceed total 3 years after NXP date code.

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