

Customer Service Note

Wafer-Level Packaging and Packaging Materials Composition

Introduction

Whole wafers of Micron's DRAM, NAND Flash memory, and PSRAM are packaged according to specific procedures to help avoid damage during shipping. Micron uses two methods for packaging wafers, including horizontal wafer shippers and vendor boxes. Micron's wafer shipments also include various labels on the inner and outer packages to enable easy identification of contents and verification of orders. The "Packaging Materials Composition" section provides complete shipping and recycling information about each of the materials used for shipping Micron® wafers.

Storage Requirements

Micron die products are packaged in a cleanroom environment for shipping. Upon receipt, the customer should transfer the die or wafers to a similar environment for storage. Micron recommends the die or wafers be maintained in a filtered nitrogen atmosphere until removed for assembly. The moisture content of the storage facility should be maintained at <10% relative humidity, and the product should be stored in the original moisture barrier bag packaging, which includes desiccant. Electrostatic discharge (ESD) damage precautions are necessary during handling. The die must be in an ESD protected environment at all times for inspection and assembly.

Under these conditions, die products contained in horizontal wafer shippers or vendor boxes can remain in storage up to six months.

Packaging Procedures

Micron's wafer shipments are packaged in horizontal wafer shippers or vendor boxes. In addition to its respective inner packing container, each shipping method includes the following: a static-shielding bag; internal padding, such as PadPak® or foam inserts; boxes; desiccant; and packing labels.

Horizontal Wafer Shippers

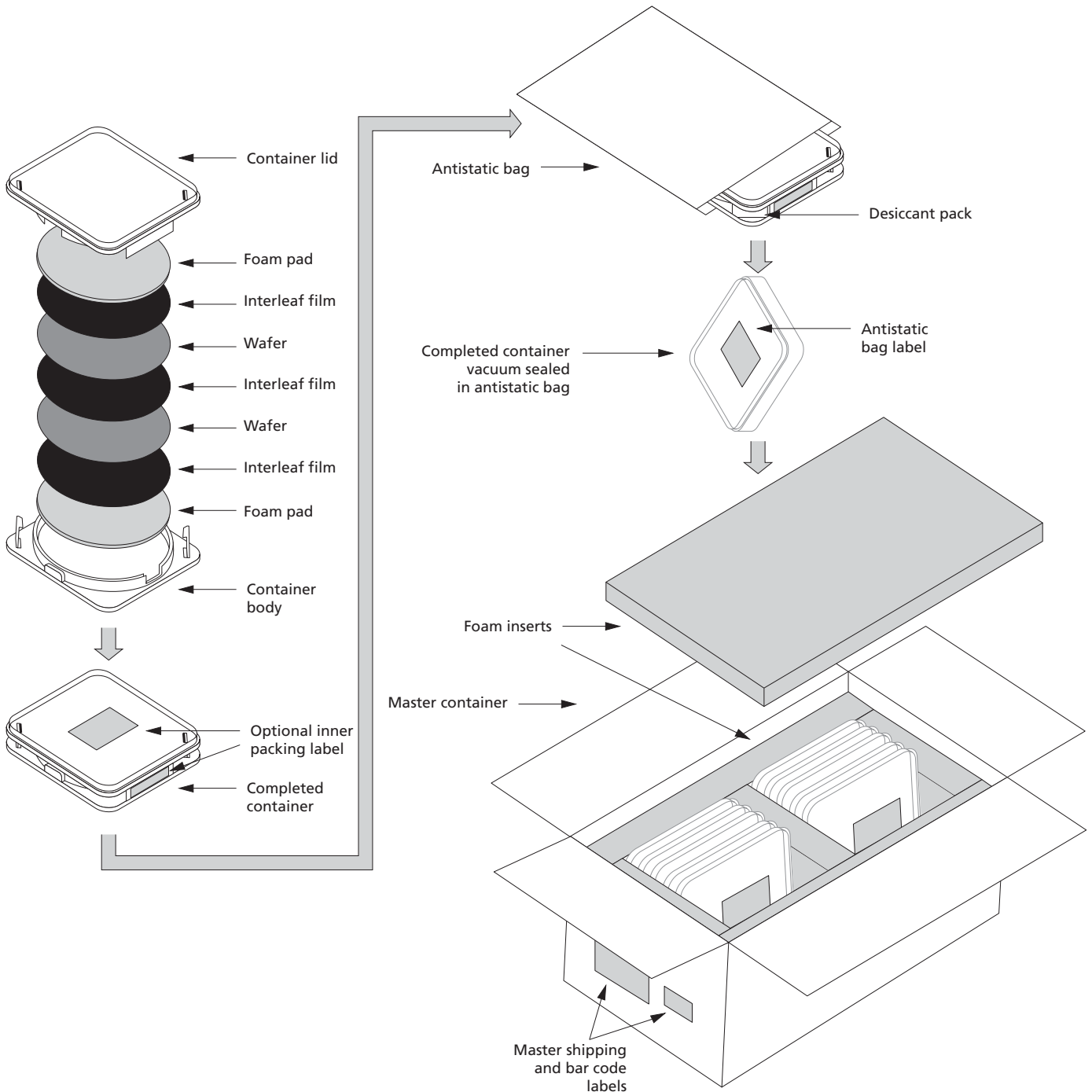
Horizontal wafer shippers, also known as coin stacks, may be used to transport wafers with a thickness $\geq 200\mu\text{m}$ for 200mm wafers or full thickness for 300mm wafers. They can hold up to 25 wafers with interleaves placed between each wafer for protection. Horizontal wafer shippers are vacuum sealed in an antistatic bag and placed in a master container with internal padding for shipping. Approximate master container sizes are shown in Table 1 on page 2.

Table 1: Master Container Sizes

Approximate Master Container Dimensions	Number of Shippers per Box
200mm Wafers (in inches)	
13.75 x 14.5 x 3	1
16 x 13.25 x 16.75	2-5
24.5 x 16 x 16.75	6-10
300mm Wafers (in inches)	
17.25 x 17.25 x 6.06	1
17.25 x 17.25 x 10.13	2
17.25 x 17.25 x 14.19	3
17.25 x 17.25 x 18.25	4

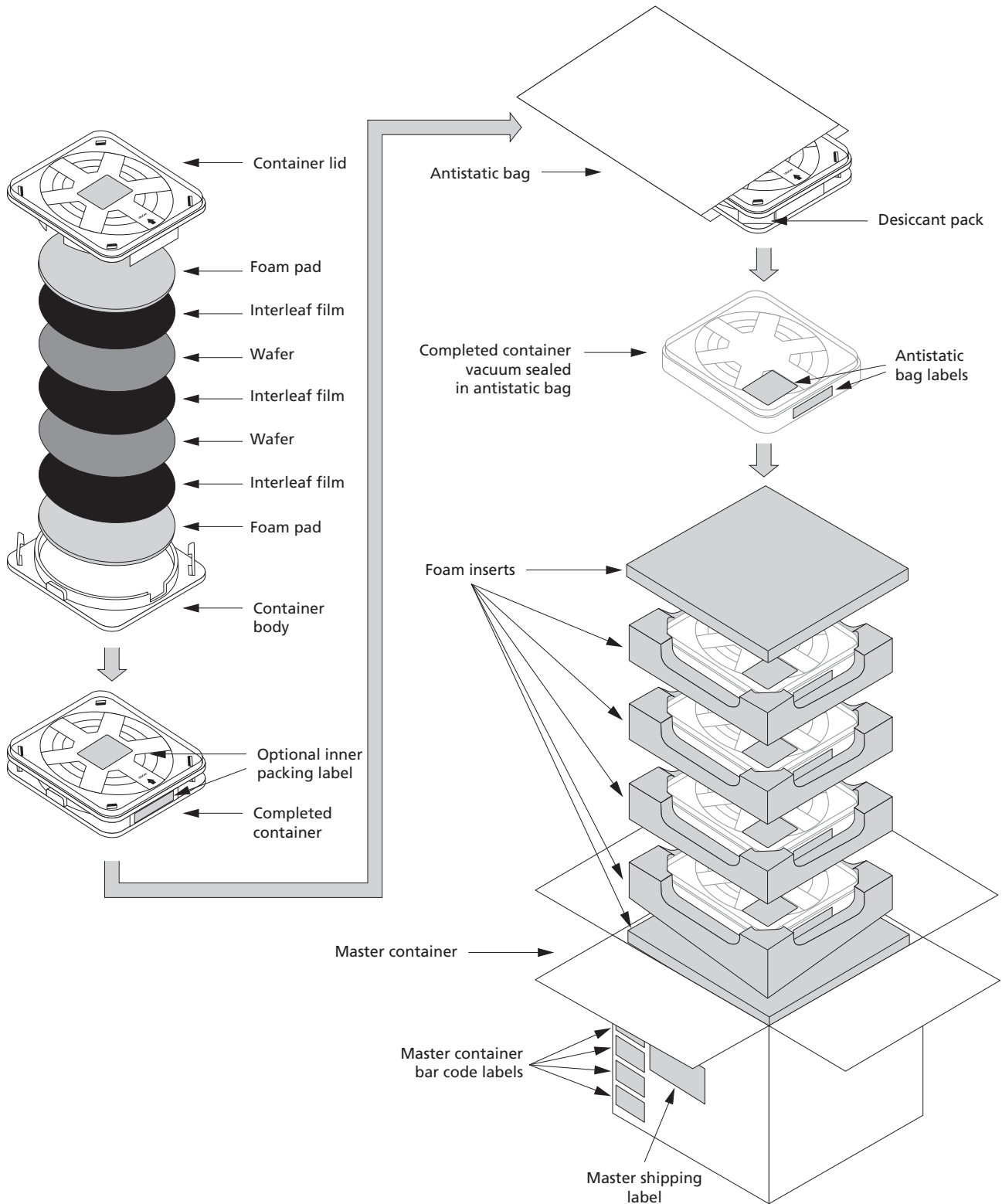
For specific packaging procedures, see Figure 1 on page 3 (for 200mm wafers) and Figure 2 on page 4 (for 300mm wafers). The same procedure should be followed for repackaging 200µm and thicker wafers in horizontal wafer shippers and returning them to Micron. For more information on returning wafers, refer to CSN-07, “RMA Procedures for Packaged Product and Bare Die Devices,” which specifies the process for requesting a returned material authorization (RMA).

Figure 1: Horizontal Wafer Shipper Packaging for 200mm Wafers



- Notes:
1. Figure 1 represents the 24.5in x 16in x 16.75in master container.
 2. Security tape is added to each outer shipping container (see Figure 5 on page 8).

Figure 2: Horizontal Wafer Shipper Packaging for 300mm Wafers



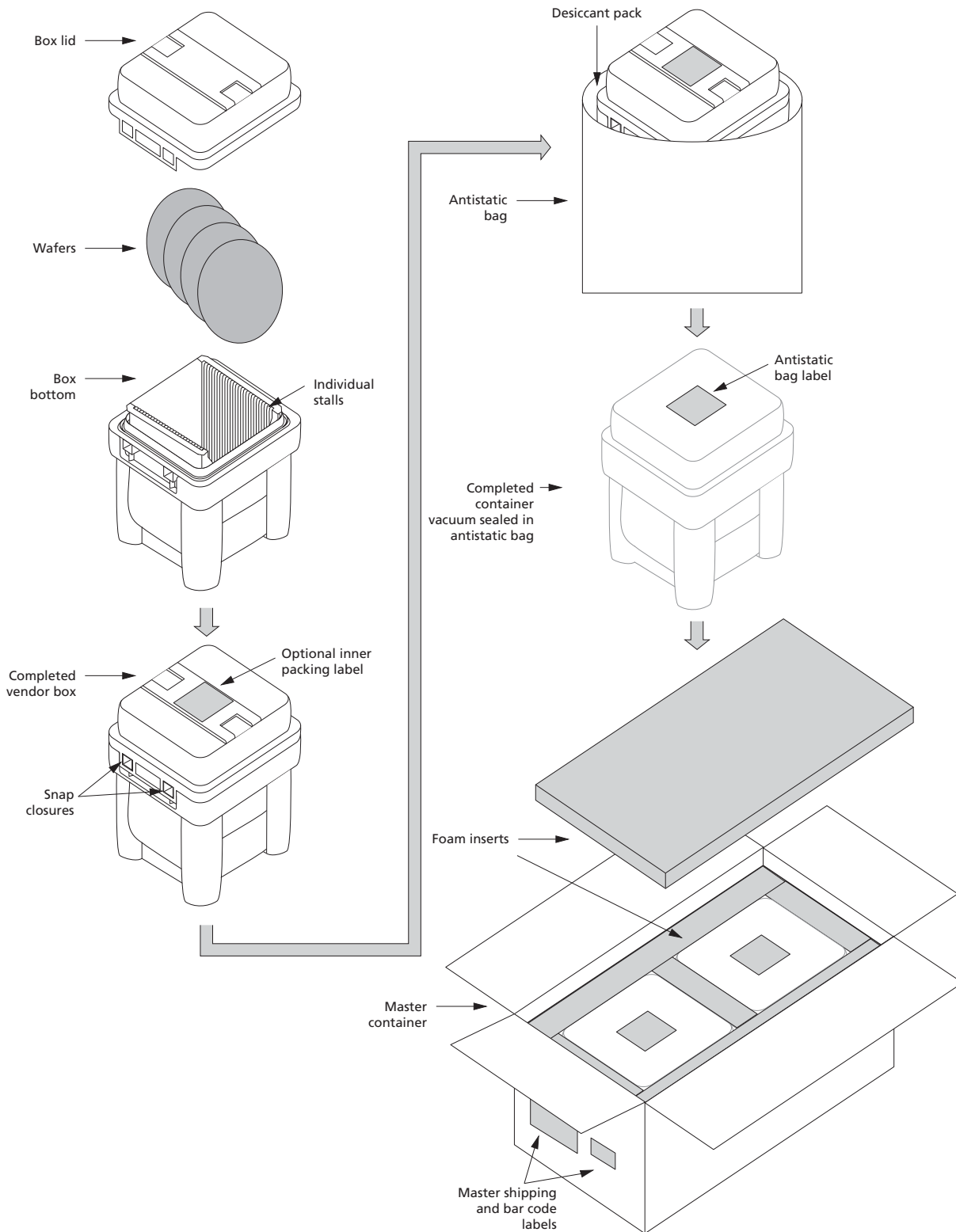
- Notes:
1. Figure 2 represents the 17.25in x 17.25in x 18.0in (4-pack) master container.
 2. Security tape is added to each outer shipping container (see Figure 5 on page 8).

Vendor Boxes

Full-thickness imager wafers of $750\mu\text{m} \pm 25\mu\text{m}$ are shipped in vendor boxes that hold up to 25 wafers per box. Wafers are inserted vertically into individual stalls in the vendor box, which is securely closed and vacuum sealed in a class 100 antistatic bag. For 200mm wafers, up to two vacuum-sealed vendor boxes are placed in a master container measuring 16in x 13.25in x 16.75in (single) or 24.5in x 16in x 16.75in (double) and then surrounded by thick foam inserts. Figure 3 on page 6 shows how vendor boxes for 200mm wafers are packaged for shipping. For 300mm wafers, a single front-opening shipping box (FOSB) is placed in a master container measuring 22in x 19.06in x 16.88in and then surrounded by molded plastic inserts or foam. Figure 4 on page 7 shows how vendor boxes for 300mm wafers are packaged for shipping.

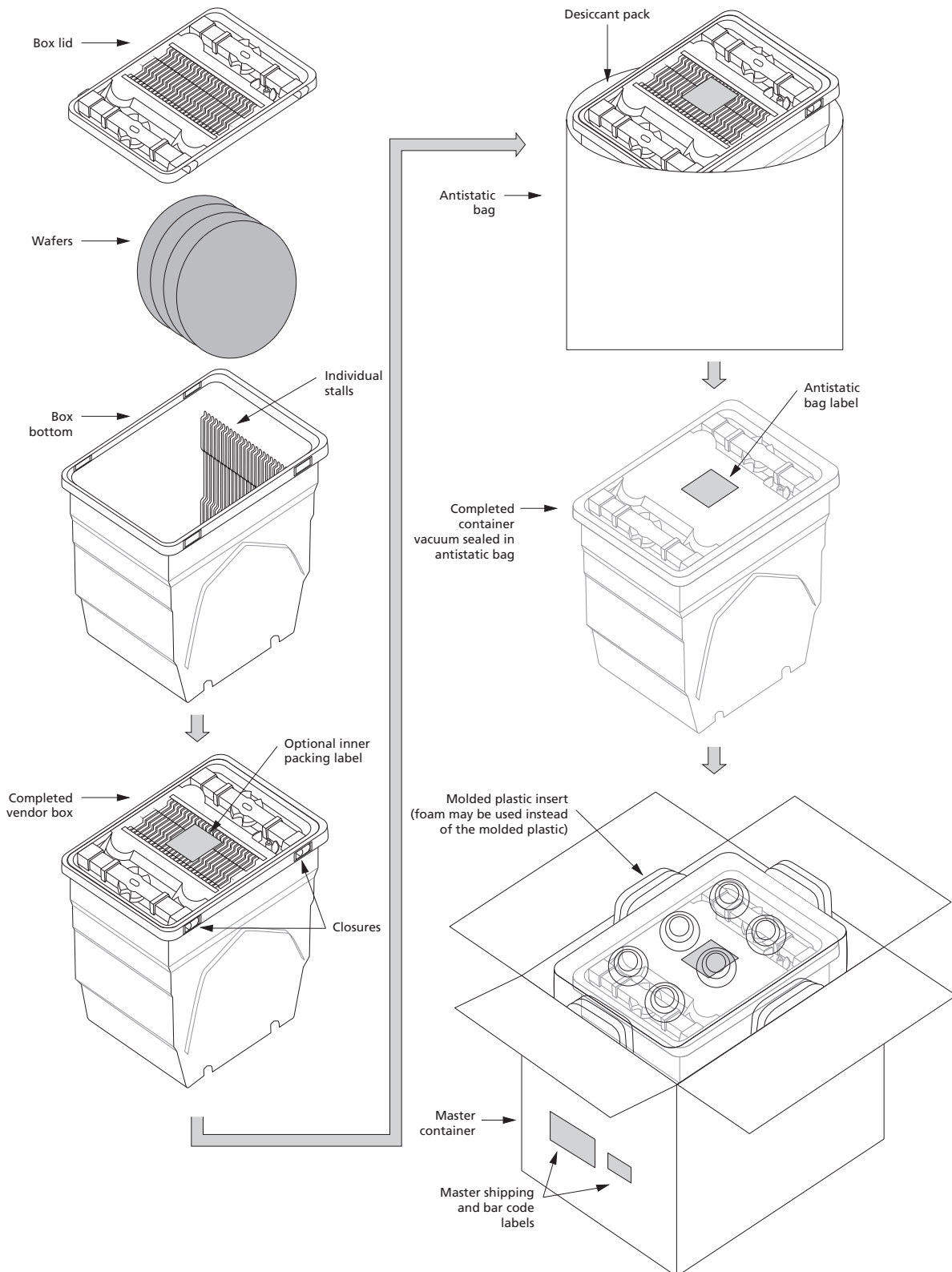
Follow the procedure in Figures 3 and 4 for repacking and returning to Micron full thick wafers in vendor boxes. For more information on returning wafers to Micron, refer to CSN-07, "RMA Procedures for Packaged Product and Bare Die Devices," which specifies the process for requesting an RMA.

Figure 3: Vendor Box Packaging for 200mm Wafers



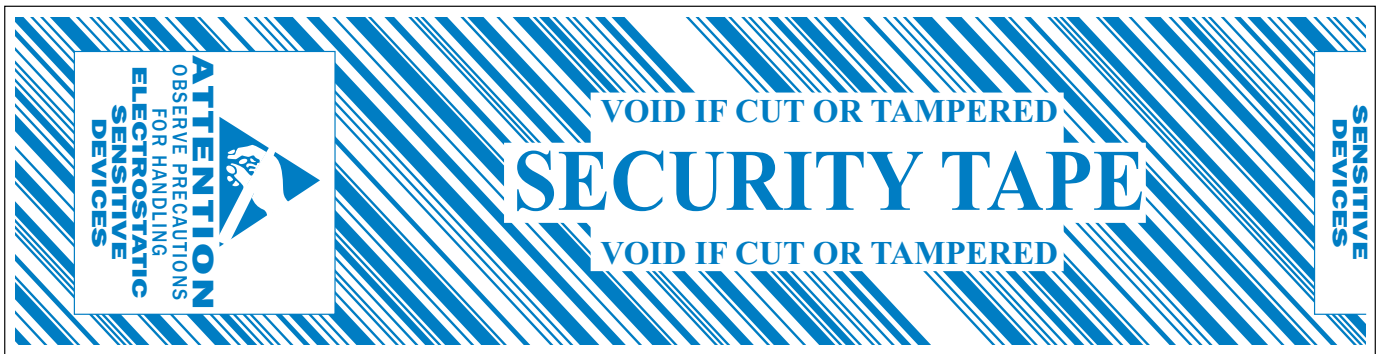
- Notes:
1. Figure 3 represents the 24.5in x 16in x 16.75in master container.
 2. Security tape is added to each outer shipping container (see Figure 5 on page 8).

Figure 4: Vendor Box Packaging for 300mm Wafers



Notes: 1. Security tape is added to each outer shipping container (see Figure 5 on page 8).

Figure 5: Shipping Container Security Tape Example



Shipping Labels

Shipments of Micron’s whole wafers are identified by several shipping and bar code labels, which include the purchase order number, an inventory of the packaged contents, and the number of separate packages in each order. This section contains descriptions and examples of the labels that may appear on Micron’s shipments.

Master Container Shipping and Bar Code Labels

Micron attaches a standard shipping label, a standard bar code label, and a singulated die/wafer bar code label to all master containers used in whole wafer shipments. Refer to Figure 6 on page 9 for details about the standard shipping label. Refer to Figure 7 on page 9 and Figure 8 on page 10 for information about the bar code labels. Micron affixes a third label to the inner shipping containers, which is described in the section “Inner Packing Container Labels.” Figures 1 through 4 show the approximate placement of these labels for each wafer packaging method.

Master Container Shipping Label Information

Micron’s master container shipping labels include the following information:

- Ship-from name: Micron’s name and address
- WB#: Courier waybill number
- Child W/B: Waybill number(s) for multiple piece(s) in shipment
- Piece: Master container package count
- PO#: Customer purchase order number
- Ship-to name: Customer’s name and ship-to address
- PKG ID: Invoice or packing slip number
- Shipping plant: The Micron location from which the order was shipped:
 - US01 = Boise, Idaho
 - US02 = Lehi, Utah
 - ME01 = Europe
 - PR01 = Aguadilla, Puerto Rico
 - SG01 = Singapore

Figure 6: Standard Master Container Shipping Label

Micron Technology, Inc. For Company Name 8000 S. Federal Way BOISE ID 83707-0006 USA	US01
	COMPANY NAME ADDRESS CITY STATE/PROVINCE ZIP CODE COUNTRY
WB # 638030055867 / 0087659818 Child W/B:63803005867 ***** Piece 1 of 1 ***** PO #s XXXXXXXX XXXXXXXX	PKG ID: 87659819A1

Figure 7: Standard Master Container Bar Code Label

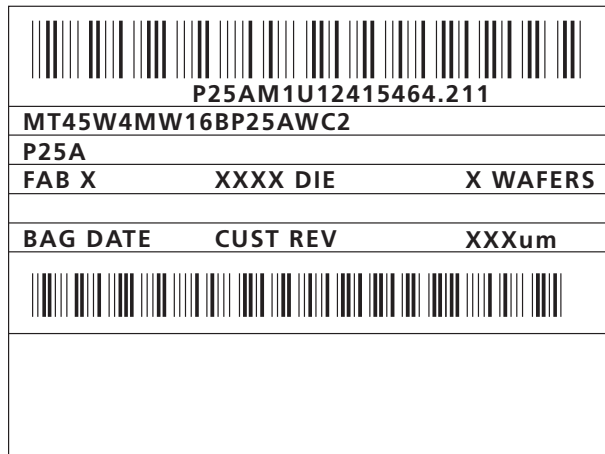
(3S) PKG ID: 87189127A1 	Ship_To_Name Address City, ST ZIP Code Country
(1P) SPLR PROD ID: MT28F400B5WG – 8 T 	Micron Technology, Inc. 1160 Exchange, Doc 1D Boise ID 83715 USA
(Q) QUANTITY: 1793 EA 	PACKAGE COUNT: 1 OF 1 16.0 x 12.0 x 8.0 in 40.6 x 30.5 x 20.8 cm
(K) TRANS ID: 2596PW3329100 	PACKAGE WEIGHT: 10.9 lb/4.9 kg SHIP DATE: 01/26/2004
(P) CUST PART NO: MT28F400B5WG – 8 T 	(4L) COUNTRY OF ORIGIN US

Master Container Bar Code Label Information

Micron’s master container bar code labels include the following information:

- Lot number, which is represented by the bar code at the top of the label
- Micron’s marketing part number, which is represented by the bar code at the bottom of the label
- Device ID
- Fab in which the product was made
- Quantity of individual die in shipment
- Quantity of individual wafers in shipment
- Date code, if designated
- Wafer thickness, in microns

Figure 8: Singulated Die/Wafer Master Container Bar Code Label



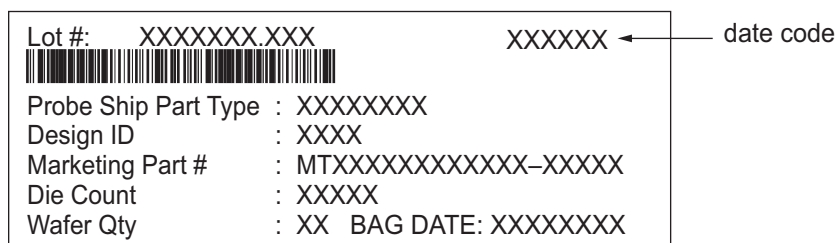
Inner Packing Container Labels

Micron affixes a standard label to each shipment's antistatic bag, shown in Figure 9. Micron also affixes a label to the front-side of each horizontal wafer shipper container's antistatic bag, shown in Figure 10. The labels may be affixed to the appropriate inner packing container as well.

Figure 9: Standard Antistatic Bag and Optional Inner Packing Container Label








Figure 10: Horizontal Wafer Shipper Front-Side Antistatic Bag and Optional Inner Packing Container Label



Packaging Materials Composition

Micron's wafer-level products are usually packaged using one of two methods: coin stack and vendor boxes. Where possible, Micron incorporates recyclable materials both in the internal packing materials and in the external coverings. Table 2 provides descriptions for the wafer-level packaging methods.

Table 2: Wafer-Level Product Packaging Materials

Element	Description ¹
General	
Boxes 	Material: Corrugated fiberboard Style: RETT w/DF (roll-end tuck-top with dust flaps) or RETT (roll-end tuck-top) Color: Natural kraft Recyclable: Yes
Labels	Base material: Matte-coated facestock or synthetic paper Adhesive material: Acrylic- or water-based adhesive Recyclable: No
Coin stack²	
Coin stack 	Material: Conductive polypropylene Surface resistivity: $<10^8 \geq 10^3$ ohms/square Recyclable: Yes
Interleaf 	Material: Carbon-loaded polyolefins or Tyvek® Surface resistivity: $<10^{12}$ ohms/square Recyclable: Yes
Cushion 	Material: Closed-cell polyethylene foam Standards: Surface resistivity: $<10^{11} \geq 10^5$ ohms/square per EIA 511.11-1993 Recyclable: Yes
Vendor box³	
Vendor box 	Material: Body case: polycarbonate Lid: polycarbonate Carrier and upper holder: polybutylene terephthalate Gasket: polybutylene terephthalate Standards: Surface resistivity: Recyclable: Reuse possible

- Notes:
1. Contact the factory for questions regarding omitted information.
 2. Applicable to product shipped in coin stacks only.
 3. Applicable to product shipped in vendor boxes only.

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Revision History

Rev. M	7/15
• Removed CUST REV from Figures 8 and 9	6/16
• Removed Date Code from Figure10.....	6/16
• Updated box sizes and foam insert types for 300mm horizontal wafer shippers	
• Updated Figures 8, 9, and 10	
Rev. L	11/13
• Revised Storage Requirements section	
Rev. K	10/12
• Added desiccant information	
Rev. J	8/11
• Added security tape information	
Rev. I	3/10
• Added wafer-relevant packaging materials information from former CSN-17	
Rev. H	6/09
• Updated template	
• Updated Figures 1 and 2	
• Updated “Horizontal Wafer Shippers” on page 1	
• Updated “Vendor Boxes” on page 5	
Rev. G	3/08
• Added antistatic bag labels to Figures 1–4	
• Added antistatic bag label references to text	
Rev. F	1/08
• Changed 300mm wafer thickness from “≥305µm” to “full thickness” in “Horizontal Wafer Shippers” on page 1	
Rev. E	11/07
• Added 300mm wafer packaging information to “Horizontal Wafer Shippers” on page 1	
• Added Figure 2 on page 4	
• Deleted film frame packaging option information	
Rev. D	4/07
• Updated template	
• Updated Figure 1 on page 3	
• Updated Figure 3 on page 6	
• Added Figure 4 on page 7	
• Added Figure 10 on page 10	
Rev. C	4/06
• Updated illustrations to show vendor boxes packed sideways into master shipping container	
• Updated container dimensions to show interior measurements	
Rev. C	3/06
• Added Figure 7, Standard Master Container Bar Code Label, on page 9.	

- Updated all master container sizes and packing illustration
- Removed last “shipments of image sensor wafers also include face tape” from page 1
- Added “non-imager” to first sentence of Horizontal Wafer Shippers on page 1
- Changed first sentence of Vendor Boxes to “Full-thickness imager wafers of 750µm ±25µm...” on page 2
- Updated master container size on page 2
- Moved inner packing label to front of vendor box in figures 2, 3, and 5
- Changed master container measurements to inches on page 5
- Removed Note 1 from page 4
- Added single-vendor-box master container to figure 3
- Updated figures 7 and 8 with Customer Rev field and DigitalClarity logo
- Updated bulleted list on page 10

Rev. B9/05

- Deleted Detaping Image Sensor Wafers section, page 1
- Added notes, Procedure for Returning Wafers in Film Frame Containers
- Updated Figures 8 and 9, pages 10 and 10
- Changed acceptable wafer thickness in Horizontal Wafer Shippers section to $\geq 200\mu\text{m}$

Rev. A5/04

- Initial release