



CHAPTER 11 DIE AND WAFER SHIPMENTS

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INTRODUCTION

Select AMD products are available in die or wafer format without having been assembled into a conventional IC package. In these formats, the devices have undergone some functional testing. When the testing has been extensive enough to cover all required temperatures and parameters, the die is referred to as either Known Good Die (KGD) if the die has been sawn from the wafer, or Known Good Wafer (KGW) if the wafer has not been sawn. Contact your AMD sales representative for information on which AMD products are available in these formats.

As shown below, several product carrier options are available for die and wafers. A distinction is made between die and KGD, as well as between wafers and KGW since the package codes in AMD's OPN (Ordering Part Number) for these differ.

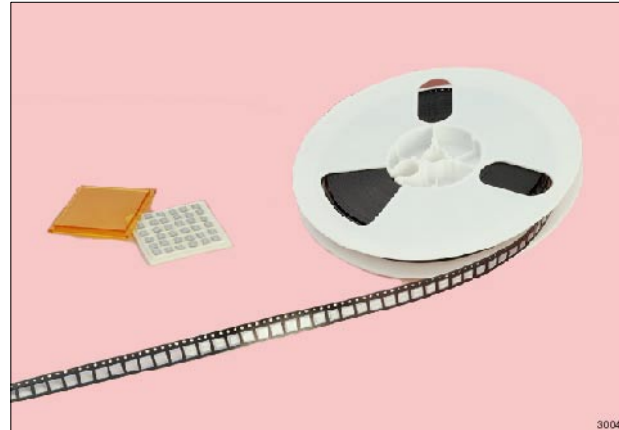


Figure 11.1 The surf-tape-and-reel carrier (right) is preferred over the waffle pack carrier (left) for shipping singulated die.

Product Carrier Guide for Die and Wafers

Device Format	Size	Device Carrier	OPN Package Code ¹	AMD Internal Package Code	Packing Container ²
Die ³	All sizes	Waffle pack	XP	GDP	Dry pack ⁴ & 4K/8C box
		Surftape and reel	XT	GDT	Dry pack ⁴ & 1R box
Wafer ³	All sizes	Wafer jar	N/A	N/A	Wafer box & 4K box
		GEL-PAK wafer tray	DW	GDW	1R box
Known Good Die (KGD)	All sizes	Waffle pack ⁵	DP	GDP	Dry pack ⁴ & 4K/8C box
		GEL-PAK die tray ⁵	DG	GDG	Dry pack ⁴ & 4K/8C box
		Surftape and reel	DT	GDT	Dry pack ⁴ & 1R box
Known Good Wafer (KGW)	All sizes	GEL-PAK wafer tray	DW	GDW	1R box
		Wafer jar ⁵	WJ	GWJ	4K box

Notes:

- 1 These package codes are part of the OPN, and not a suffix to the OPN.
- 2 Explanations of the packing container names can be found in *Chapter 13 Packing Methods and Labels*.
- 3 Die refer to fabricated silicon die that have been singulated but not functionally tested. Wafer refers to fabricated silicon wafers, either sawn or unsawn, but still mounted on the wafer mount tape.
- 4 This product is packed in dry pack bags for protection; however, as it is not moisture sensitive product, the product is not baked prior to packing.
- 5 Optional; upon customer request only.

CARRIER DESIGNS FOR SINGULATED DIE

AMD offers the following carrier designs and materials for singulated die:

- Waffle pack
- Surftape-and-reel
- GEL-PAK die tray

Waffle Pack. Waffle packs have been the traditional carrier for singulated die, especially die that has not been functionally tested to KGD levels. The waffle pack is made of conductive, polypropylene, and its size is standardized at two inches square. In an array across the tray are indented pockets for housing each dice. The quantity of pockets per waffle pack varies depending on the die size. A dice is placed in each pocket and orientated to be consistent with all other die in the tray. A slip of lint-free, glassine paper is placed over the array of die, and then another waffle tray is stacked on top. Up to five waffle packs are uniformly stacked and secured in place with two plastic clips, as shown in *Figure 11.2*. Up to nine stacks of waffle packs are sealed in a dry pack bag for extra cushioning protection. A pre-baked Humidity Indicator Card (HIC) and a desiccant are included in the bag during vacuum packing. The dry pack bags are packed into a 4K/8C Q-PACK™ box for shipment.

- **Waffle Pack Labels** - A die sale label is applied to the top cover of each stack of waffle packs. The same label is applied to the outside of the dry pack bag. *Figure 11.3* provides an example of this label.

Surftape and Reel. The surftape-and-reel carrier, shown in *Figure 11.1* on page 11-2, is AMD's optimum carrier design for shipping singulated die in a format compatible with a high-volume, automated board assembly operation. It is preferred over waffle packs because it eliminates movement of the die during shipment, thus reducing the risk of damage. Also, many different die sizes can be accommodated with only a few standard surftape sizes.

The design for surftape-and-reel is similar to the standard tape-and-reel carriers popular for conventional surface-mount packages. It consists of a surftape wrapped around a reel having a standard size diameter of 7-inches (178 mm). Two sizes of surftape, all fitting on the same standard size reel, are available to accommodate the range of die sizes offered by AMD in die format.

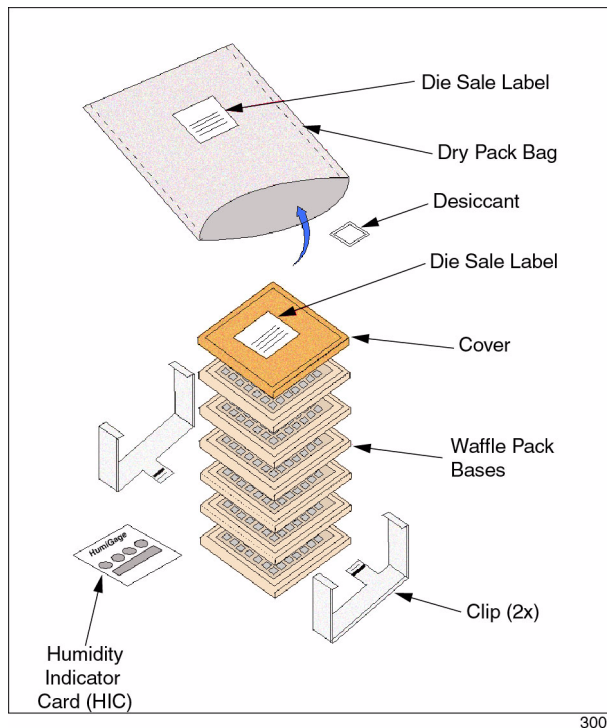


Figure 11.2 Waffle packs are carefully packed for shipment.

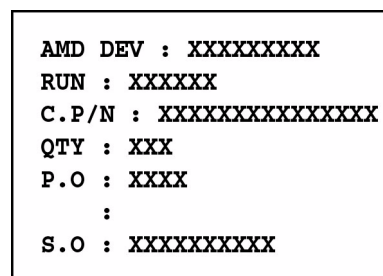
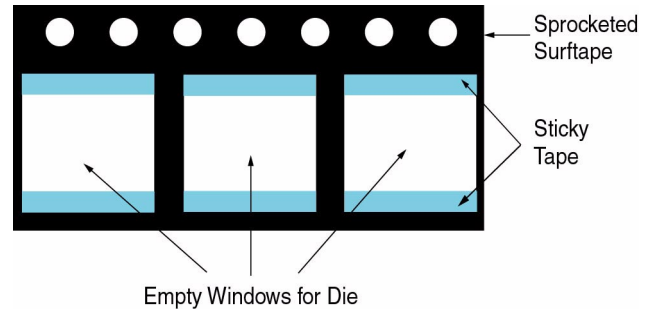


Figure 11.3 A die sale label is applied to the cover of each waffle pack stack, as well as to the outside of the dry pack bag in which the stacks are packed.

- **Surftape Design** - The surftape, as illustrated in *Figure 11.4*, consists of a conductive, polystyrene tape with windows punched in it to create a slightly recessed pocket for each dice. Two strips of sticky tape backing are attached along the two sides of the window. The sticky tape has a pressure-sensitive adhesive coating which holds each dice in place, thus eliminating the risk of damage to the dice due to movement. The sticky tape allows for easy and safe removal of each dice during the push-up step in the pick-and-place operation.



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Figure 11.4 Sticky tape runs along the two sides of each window of the surftape to hold the die in place.

Each dice is loaded into the surftape with the topside of the dice exposed and the dice orientation consistent throughout the reel. The adhesive strips within each window secure each dice in place. Because the pocket is slightly recessed, each dice is protected from exposure by the next layer of surftape wound around the reel. There are at least 1000 mm of surftape left empty at the beginning of the reel (i.e., the leader pockets) and at least 1000 mm of tape left empty at the end of the reel. A cover tape of acetate is wrapped around the outer layer, and a surfwrap end sticker (see *Figure 11.5*) holds this in place.



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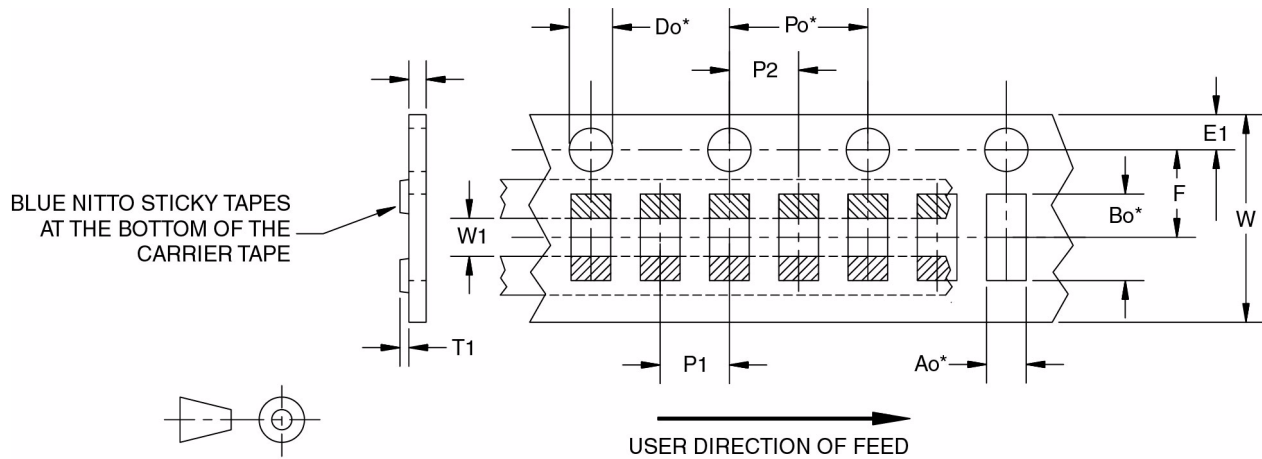
Figure 11.5 An end sticker is applied to the outer strip of acetone tape to secure the surftape on the reel.

- **Surftape Dimensions** - The dimensions of AMD's surftape, which conform to the EIA 481 standards, are shown on *page 11-5*. The Ao and Bo dimensions are the critical ones for determining which tape size is required for a specific dice size. Consult your AMD sales representative to obtain specific product dice size information.
- **Die Orientation** - Die orientation in the surftape is uniform for all die in the tape. For the most part, the device pin one is orientated to the top of the pocket, parallel with and on the side closest to the sprocket holes. Contact your AMD sales representative for more product-specific information.

Placement of the dice in the cavity shall be centered, with no more than a ± 0.05 mm variation from the centerlines of the cavity.

- **Reel Design** - Each surftape is wound around a plastic, antistatic reel that has a uniform diameter of seven inches for all surftape sizes. The dimensions for these and the die counts per reel are provided on *page 11-6*.
- **OPNs per Reel** - Only one wafer lot is loaded into each reel. Therefore, there will never be a mixture of different Ordering Part Numbers (OPNs) in a reel.
- **Surftape and Reel Packing** - Surftape and reel packing is covered in the following paragraphs, including information about what labels are applied to the reel, dry pack bag, and 1R box.

Surftape Dimensions



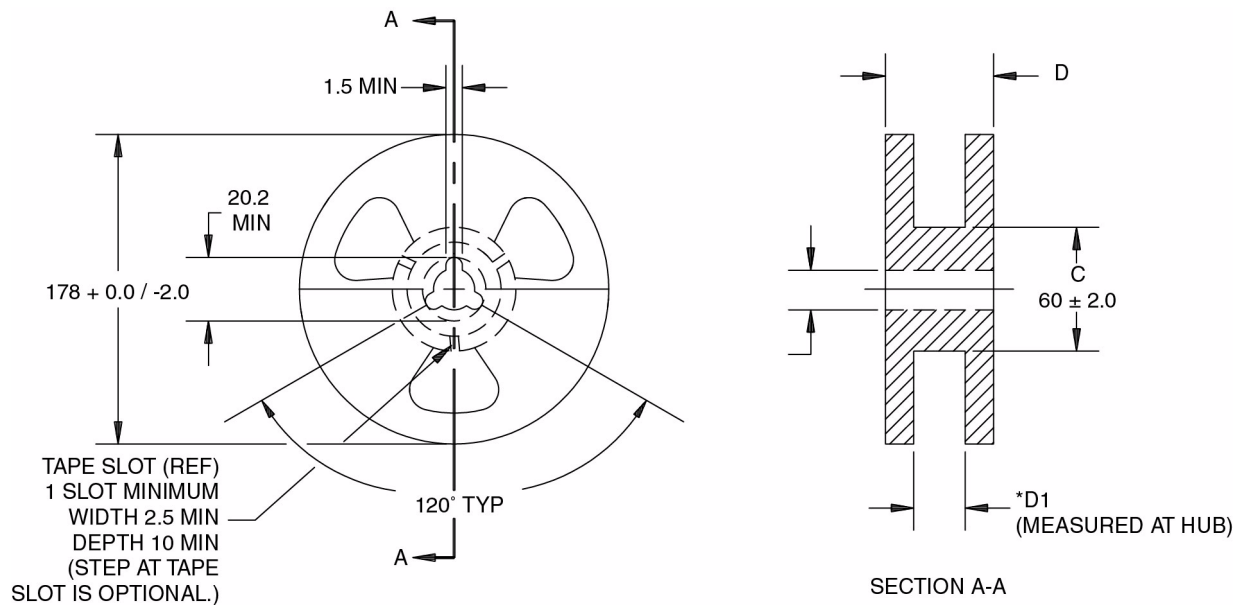
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Tape Size ²	Tape ³				Pockets and Pitch ³							
	W (Max)	W1 (Nom)	T (Max)	T1 (Max)	Ao (Nom)	Bo (Nom)	Do	E1	Po	P2 ⁴ (Basic)	P1 ⁴ (Basic) (Pitch)	F (Basic)
12 mm	12.1	2.5	0.85	0.10	6.35	6.35	1.5	1.75 ±0.05	4.0 ±0.025	2.0	8.0	5.5
16 mm	16.1	2.5			10.2	10.2	+0.05 -0.00				12.0	7.5

Notes:

- 1 All dimensions are in millimeters.
- 2 The tape size listed pertains to the width of the tape. Which size applies is determined by the product die size. Contact your AMD sales representative to find out which applies to the specific AMD product.
- 3 Tolerances are ±0.1 mm unless otherwise specified.
- 4 The P1 and P2 dimensions change to having a tolerance of ±0.05 mm when the die is placed. This is based on the centerline of the die.
- 5 An asterisk (*) denotes critical dimensions.
- 6 There are 1000 mm of leader tape and 1000 mm of trailer tape.

Reel Dimensions and Quantity per Reel



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Tape Size	Width of Reel ²		Device Counts Per Reel ⁵
	D (Max)	D1	
12 mm	18.4	12.4	2500
16 mm	22.4	16.4	1600

Notes:

- 1 All dimensions are in millimeters.
- 2 Tolerances are: $xx.x = \pm 0.5$ mm and $xx = \pm 2.0$ mm, unless otherwise stated.
- 3 These dimensions may vary by $+2.0$ mm and -0.0 mm.
- 4 An asterisk (*) denotes a critical dimension.
- 5 There is at least 1000 mm of surftape left empty at the beginning of the reel (i.e., the leader pockets) and 1000 mm of tape left empty at the end of the reel.
- 6 To determine which reel size applies to the specific AMD product in die format, consult your AMD sales representative.

Surftape and Reel Packing and Labeling. Each surf-tape-and-reel carrier is packed in a dry pack bag, wrapped in bubble pack for cushioning protection, and then packed in a 1R box. A label, a sample of which is shown in *Figure 11.6*, is applied to each reel, as well as to the dry pack bag, to identify the contents of the reel and provide some traceability information about the wafer lots from which the die came. Information contained on the label includes wafer run number, date code, die quantity, ordering part number, assembly lot number, and customer part number.

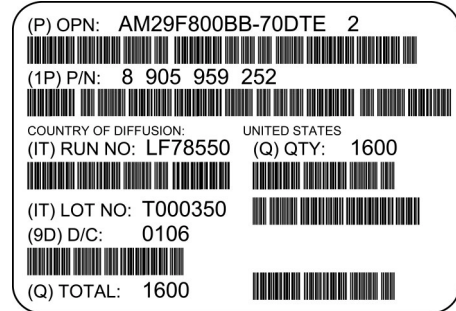
A Q-PACK™ inventory label is applied to the outside of each 1R box in which surf-tape-and-reel carriers are shipped. A sample of this label is shown in *Figure 11.7*. See *Figure 13.5 on page 13-8*, for a description of the information contained on the Q-PACK™ inventory label.

Figure 11.8 on page 11-8 illustrates the packing sequence for surf-tape and reel.

Contact your AMD sales representative if you have additional questions.

GEL-PAK Die Tray. AMD also offers GEL-PAK product carriers for singulated die, upon customer request only. As this is a more costly product carrier, AMD recommends it be used only in cases of low-volume production.

Contact your AMD sales representative for more information if you are interested in this carrier option.



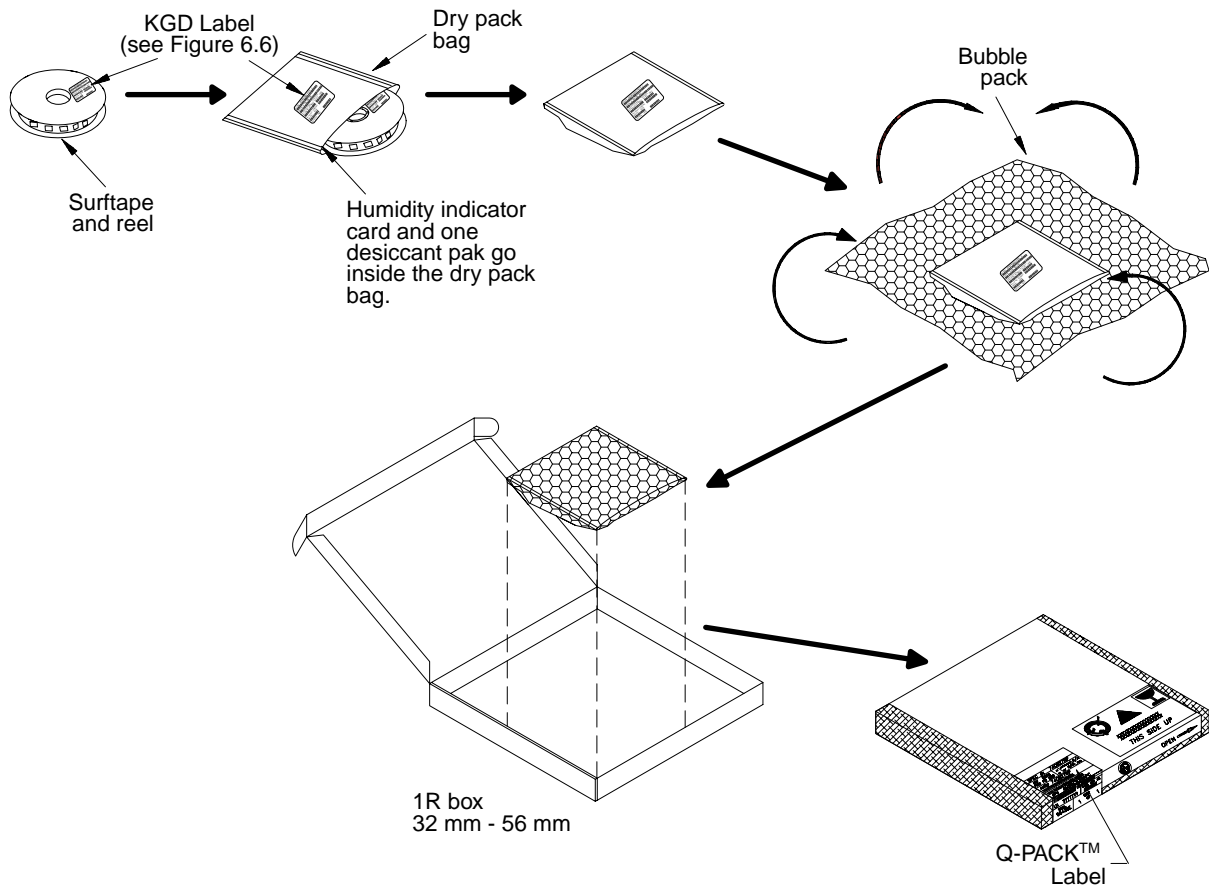
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Figure 11.6 A sample standard KGD label.



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Figure 11.7 A Q-PACK™ inventory label is applied to the outside of each 1R box.



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Figure 11.8 Each surf-tape-and-reel is packed in a dry pack bag, wrapped in bubble pack for cushioning protection, and then packed in a 1R box.

CARRIER DESIGNS FOR WAFERS

AMD offers two types of carrier designs for wafers. These include:

- Wafer jar
- GEL-PAK wafer tray

Wafer Jar. Wafer jars are the standard product carrier for fabricated wafers that have not been functionally tested. Wafers are packed in a wafer jar that is made of conductive, polypropylene, on top of an insert of antistatic, polyurethane foam. Another insert of this foam, or as many as needed to fill the jar, is placed on top of the wafer stack. A piece of lint-free filter paper is inserted between each wafer. A wafer jar lid, made of the same material as the jar, snaps onto the jar.

Each jar is labeled to identify its contents.

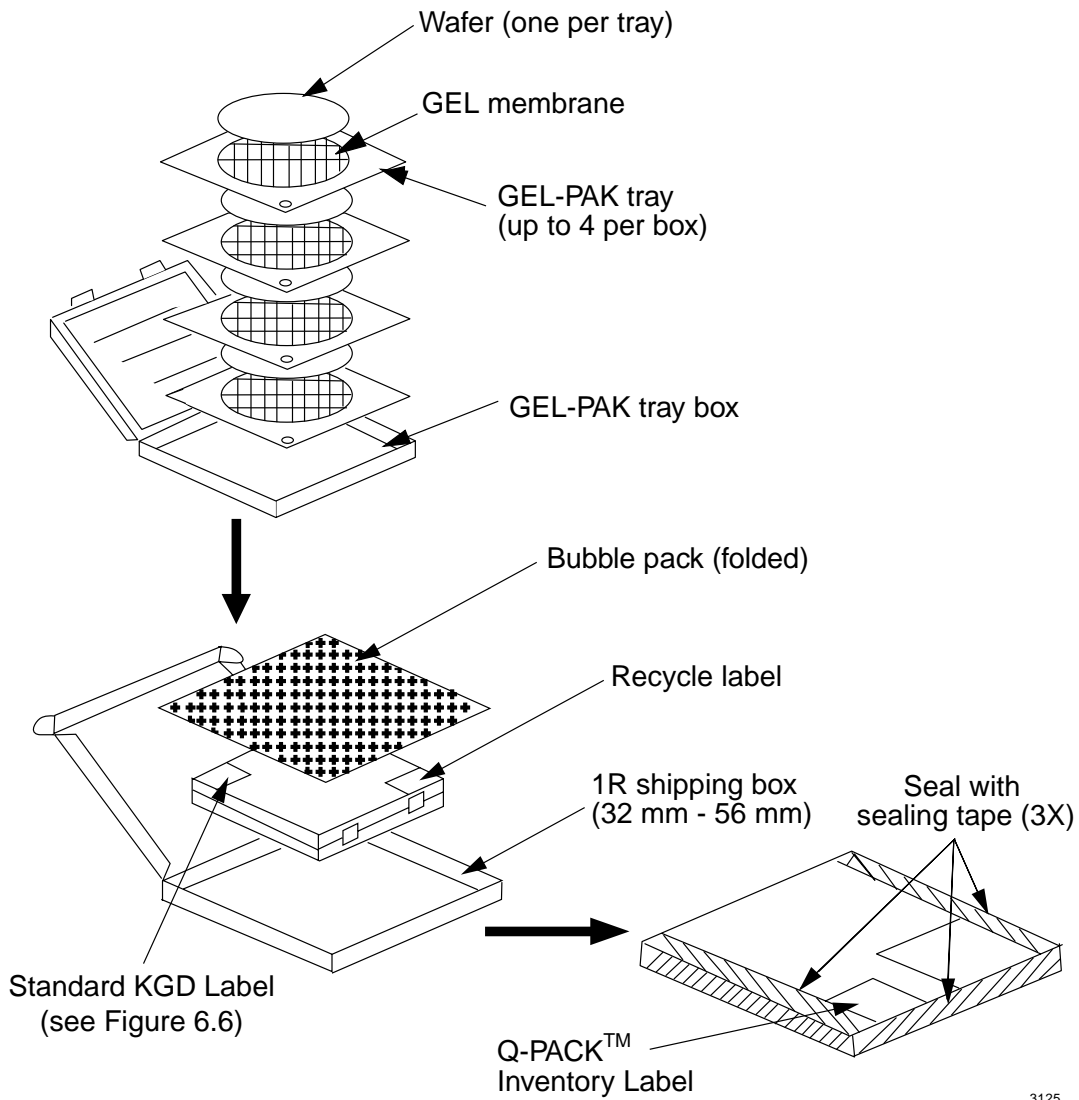
Generally, the wafer jars are packed for shipment in a 4k box, however a larger box may be used if there are enough jars to warrant it. Bubble pack sheets are used as dunnage to take up any excess space. Each box is then labeled with a standard Q-PACK™ inventory label (see *Figure 11.7 on page 11-7*).

GEL-PAK Wafer Tray. GEL-PAK wafer trays have become a more popular carrier for wafers because their design is compatible with presentation to commonly used wafer saw equipment. The GEL-PAK wafer tray is typically used for unsawn wafers, although it is also compatible for use with sawn wafers that are still intact on the sticky tape from the sawing operation.

- **Design and Materials** - The GEL-PAK wafer tray is a standard, square size that can accommodate wafers up to 8 inches in diameter. An adhesive GEL membrane is stretched across the tray and the wafer is placed on top of this membrane (see *Figure 11.9 on page 11-10*). Up to four GEL-PAK wafer trays, with a slip of glassine paper placed between each tray, can be stacked into a GEL-PAK tray box. The conductive properties of the GEL membrane protect the wafer beneath it from electrical damage.
- **GEL-PAK Wafer Tray Packing and Labeling** - *Figure 11.9 on page 11-10* illustrates the packing sequence for wafers in GEL-PAK wafer tray boxes, and the labels that are applied. Each GEL-PAK wafer tray box is labeled to identify the contents and provide some production traceability information. Information contained on the label includes wafer run number, date code, die quantity, ordering part number, assembly lot number, and customer part number.

Each GEL-PAK tray box is then packed in a 1R box, which is labeled with a standard Q-PACK™ inventory label (*Figure 11.7 on page 11-7*).

If you require additional information about the GEL-PAK wafer tray design and packing method, contact your AMD sales representative.



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Figure 11.9 Wafer GEL-PAK trays are popular carriers for Known Good Wafers because the wafers are mounted in a configuration that is adaptable to wafer sawing operations.