



TMS320C44 DSP

Packaging Guide

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Digital Signal Processing Solutions



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Packaging Instructions

TI has developed handling and packing techniques to protect the leads from handling damage at the device level, in trays, and in packed trays (boxed) for shipping. These techniques have been translated from TI manufacturing specifications, and they are discussed in this booklet as suggested guidelines for your handling operations. TI hereby releases any reproductive restrictions on their use and encourages you to adopt them or modify them within your own operation.

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Introduction

The TMS320C44PDB DSP device family uses the 304 PowerQuad II™ package. The 304 PowerQuad II package is a fine-pitch, high-pin-count package that contains a heavy copper slug for heat dissipation. The package is very heavy due to the copper heat slug. The package weight in conjunction with the fine pitch and high pin count makes the package particularly susceptible to lead damage. Damage to the leads can cause assembly problems when mounting the package into the customer's system application.

We hope that you will find this booklet helpful in handling the TMS320C44PDB to maintain its high quality and in preserving your device warranty protection.

The specs are reproduced just as our operators see them on the line. If you have any questions, please contact your local TI sales representative.

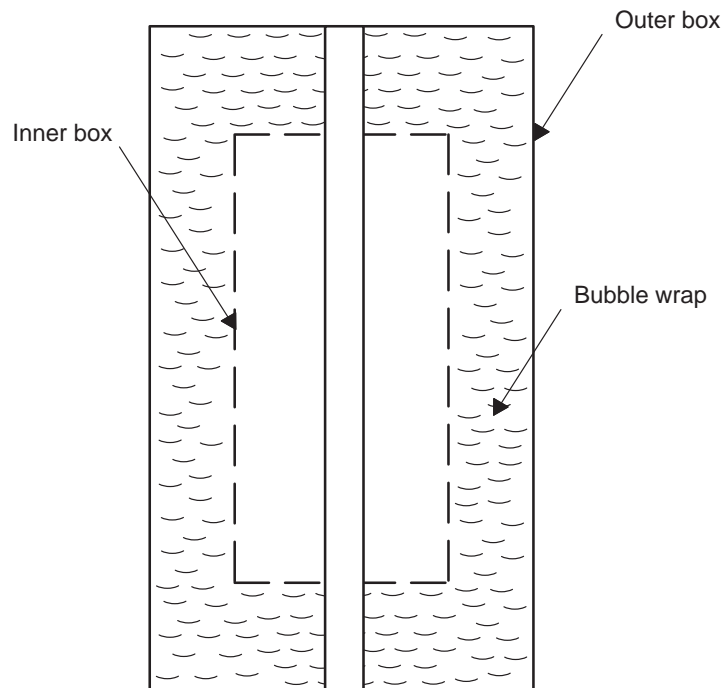
'304 Power Quad II package is a registered trademark of ANAM/AMKOR Incorporated.

Shipping and Storage

TI qualification testing has now been completed. This testing, which included multiple dead drops of up to three feet, indicates that this packaging procedure sufficiently protects and preserves original lead dress integrity. The testing results also reinforced our belief that such extraordinary packing procedures should be maintained until the device is safely mounted.

The packing technique consists of an inner box inside an outer box, or box-in-a-box packing methodology. See Figure 1.

Figure 1. Packing Technique — Top View



The devices are first packed in trays. A tray bundle is then formed and is placed in a dry pack bag. The tray bundle (inside of a dry pack bag) is then placed inside an inner (JEDEC) box (this practice is common to MOS-integrated circuits within the industry as well as at TI). The inner (JEDEC) box is then placed into an outer box surrounded by foam packing material. For the TMS320C44PDB, this cushioning provides shock absorption if the outer box is accidentally dropped during shipping or is otherwise jostled in handling.

Therefore, if it is necessary to unpack devices prior to end use, Texas Instruments strongly recommends that all remaining devices and trays be repacked in the same manner. The repacking should occur immediately after the early removal of any devices or trays. This recommendation also applies to the stock storage of these devices.

Do not discard the packing boxes and bubble wrap material when you unpack the 'C44 DSP devices. Save these materials until all devices have been mounted. If the devices are not repacked in the original packing materials, there is a risk of lead damage.

Packing Devices Into Trays

Using the equipment and materials specified, follow the procedure below to pack the devices into the JEDEC tray.

Equipment

- Grounded workstation
- Worktable with grounded conductive mats on top surface
- Static-control wrist straps and ground wires

- Vacuum pencil
 - Virtual part number: v8901-a-esd
 - Nepenthe part number: NEP3-VAC2

Materials

- JEDEC trays
 - Daewon part number: 121-4040-711
 - PEAK part number: 4080304-0001
(12 units per tray)

Note:

You can use materials made by other manufacturers, provided they are of equivalent quality.

Procedure

Packers must wear static-control wrist straps that are connected to ground in accordance with ESD procedures. Devices must not be touched without using a vacuum pencil.

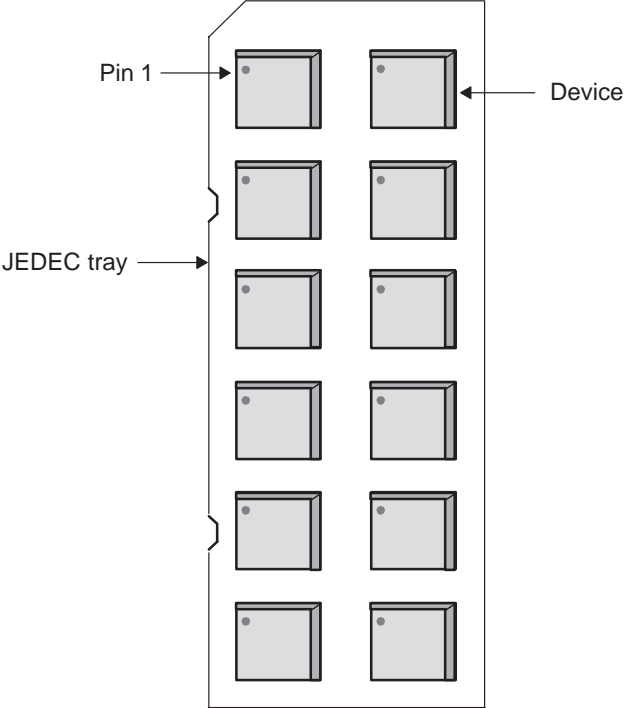
Step 1: Put on the static-control wrist strap.

Step 2: Using a large diameter suction-cup (1/2") vacuum-pencil attachment to handle each device, insert the devices into the JEDEC tray so that the notch end (pin 1) of each device is oriented in the same direction in the tray, as shown in Figure 2.

Note:

The vacuum pencil must have enough suction to prevent it from dropping the package. TI recommends a suction cup diameter of 1/2 inch.

Figure 2. Pin Orientation in JEDEC Tray



Packing Trays Into Tray Bundles

Using the equipment and materials specified, follow the steps below to assemble the tray bundles.

Equipment

- Grounded workstation
- Worktable with grounded conductive mats on top surface
- Static-control wrist straps and ground wires
- Semi-automatic strapper – Strapex Model 351-600
- Safety glasses

Materials

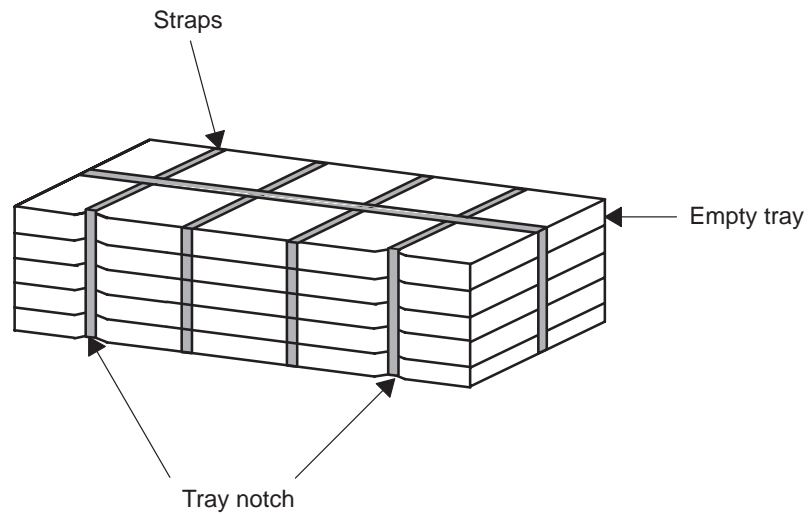
- 3/8 or 1/2 inch strapping material
- Conductive cardboard sheets
 - Olin part number: PXIHT-0005
 - TI part number: 1041370-0112
- JEDEC trays
 - Daewon part number: 121-4040-711
 - PEAK part number: 4080304-0001
- JEDEC IC box conductive dry pack bag
- Dessicants
- Humidity indicator card

Procedure

Step 1: Arrange the five trays as shown in Figure 3. All trays in a bundle must be oriented in the same direction. The number of trays per bundle is five. The five trays consist of four full trays and one empty tray on top, which serves as a cover. Do not use partial trays

Step 2: Place five straps around the tray bundle as shown in Figure 3.

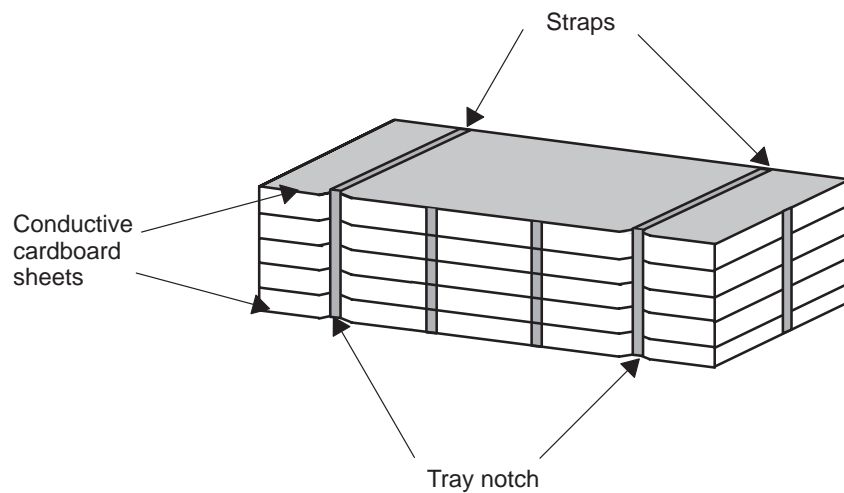
Figure 3. Tray Bundle



Step 3: Center a conductive cardboard sheet on both the top and bottom of the bundle.

Step 4: Strap the conductive cardboard sheets into place with the strapping material by placing one strap at each end of the tray bundle in the notch area. Strapping tension should be from 2000 – 4000 grams/square. See Figure 4.

Figure 4. Tray Bundle With Conductive Cardboard Sheets



Step 5: Place the tray bundle into a conductive dry-pack bag, add dessicants and a humidity-indicator card, and seal it in the standard procedure.

Dry-Pack Bag Requirements

This bag contains moisture-sensitive devices.

- The shelf life in sealed bag is 12 months at $< 40^{\circ}\text{C}$ and $< 90\%$ relative humidity (RH).
 - After this bag is opened, devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temperature 220°C) must be:
 - Mounted within 72 hours at factory conditions of $\leq 30^{\circ}\text{C}/60\%$ RH, or
 - Stored at $\leq 20\%$ RH.
 - Devices require baking before mounting if:
 - Humidity Indicator Card is $> 20\%$ when read at $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$, or
 - Either of the requirements listed under the preceding bullet are not met.
- 1) If baking is required, devices may be baked for:
- a) 192 hours at $40^{\circ}\text{C} + 5^{\circ}\text{C}/-0^{\circ}\text{C}$ and $< 5\%$ RH for all device containers, or
 - b) 24 hours at $125^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for device containers rated at 125°C or above.

Packing the Tray Bundles Into the Inner Box

Using the equipment and materials specified, follow the steps below to pack the tray bundles into the inner box.

Materials

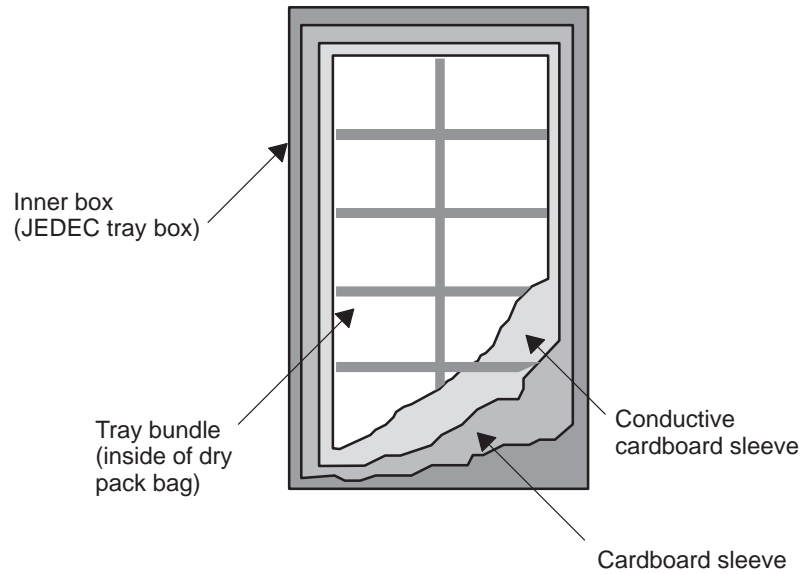
- Cardboard sleeves
 - Olin part number: PXHIT-0003 (20)
 - TI part number: 1041370–0104
- Conductive cardboard sleeves (20)
 - Olin part number: PXHIT-0002
 - TI part number: 1041371–0123
- Single JEDEC tray box
 - Olin part number: PXHIT-0001
 - TI part number: 1041286–0146
- Bubble pack sheets
 - TI part number: 1041370–0221

Procedure

- Step 1:** Place the bagged tray bundle into a conductive cardboard sleeve, as shown in Figure 5.
- Step 2:** Place the conductive cardboard sleeve into another cardboard sleeve.
- Step 3:** Place the tray bundle with both cardboard sleeves around it into the inner (JEDEC) box.

If the tray is loose in the inner box, use bubble pack as a filler. Place equal amounts of bubble pack above and below the tray stack to vertically center the devices in the box. Do not allow empty vertical space after the tray stack and filler material have been added to the box. Use moderate compression of filler material when closing the box to prevent movement during shipment.

Figure 5. Packing the Inner Box



Step 4: After placing the bundle inside the the box, close the box and secure it with strapping (3/8 or 1/2 inch polyethylene) in two places (one at each end) or with tape (Mylar or reinforced paper tape) along the open edges of the box flaps.

Packing the Inner Box Into the Outer Box

Using the equipment and materials specified, follow the steps below to assemble and pack the outer box.

Equipment

- Manual box stapler (optional)
- Scissors

Materials

- Outer box
 - Corrugated fiberboard
 - 200# C flute
 - TI part number: 4061150–0001
- Bubble pack (wrap sheets)
 - TI part number: 1041371–0109
- Box staples – 5/8 inch (optional)
 - Josef Kilhberg – Sweden (Type B/Series #8811)
- Box tape – reinforced
 - TI part number: 1041411–0003
- Box tape – 2-inch clear Mylar
 - 3M part number: 373

Procedure

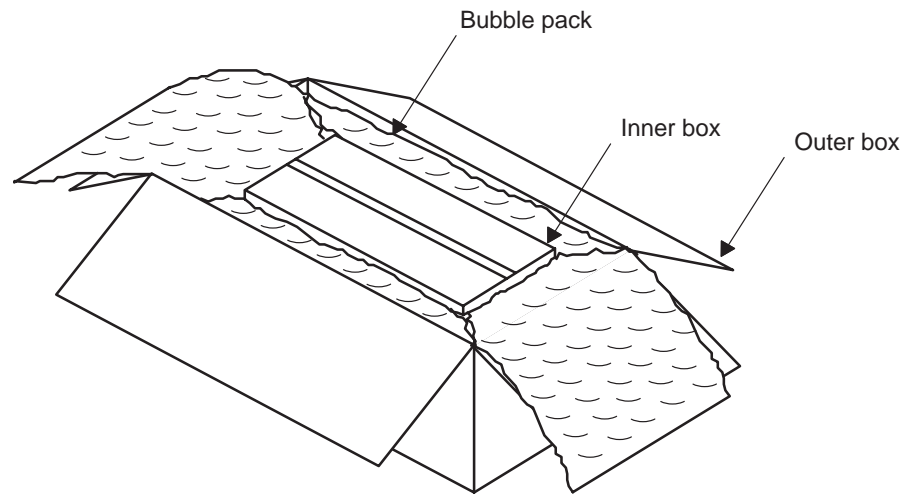
- Step 1:** Assemble the outer box by securing the bottom flaps together with four staples (two at each box end) or by applying reinforced box tape along the bottom edge.
- Step 2:** Tear a segment of bubble wrap (12 × 24 inch) from the perforated roll, and cut it into three equal pieces with scissors (12 × 8 inch).
- Step 3:** Place one sheet of bubble wrap (12 × 8 inch) flat in the bottom of the outer box. Tear a five-segment strip of bubble wrap from the perforated roll (60 × 24 inches), and fold it in half (with the smooth side out) forming a double layer (30 × 24 inches).
- Step 4:** Fold out the top flaps of the outer box.
- Step 5:** Center the double layer of bubble wrap over the opening of the outer box.

The long dimension of the bubble wrap should be oriented to correspond to the long dimension of the outer box.

Step 6: Place the inner box face up in the center of the bubble wrap and push it down into the outer box. Equal lengths of wrap should emerge from opposite sides of the box. Do not allow bunching except in the corners.

Figure 6 shows the inner box nested inside the outer box with a protective cushion of bubble wrap around the sides and the bottom.

Figure 6. Packing the Inner Box Inside the Outer Box



Step 7: Neatly fold excess bubble wrap from the sides down against the top of the inner box.

Step 8: Tear a segment of bubble wrap (12 × 24 inch) from the perforated roll, and use it to fill the void area on top of the inner box.

Step 9: Close the outer box by folding the top flaps down.

Step 10: Seal the outer box by applying reinforced or Mylar tape along the top edges.

The box is now ready to be moved into the shipping area.

