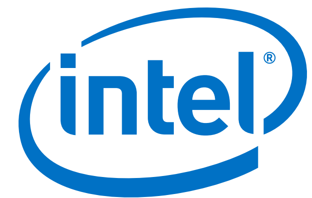

# AN 71: Guidelines for Handling J-Lead, QFP, BGA, FBGA, and Lidless FBGA Devices

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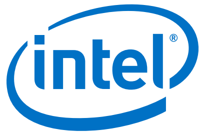



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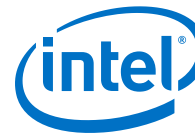


# 1. Guidelines for Handling J-Lead, QFP, BGA, FBGA, and Lidless FBGA Devices

This application note provides guidelines for handling J-Lead, Quad Flat Pack (QFP), and Ball-Grid Array (BGA, including FineLine BGA [FBGA] and lidless FBGA packaging) devices to preserve the quality of these devices during storage, shipment, and transfer and to ensure easier soldering.

Devices that use surface-mount J-Lead, QFP, BGA, FBGA, and lidless BGA are now common on boards because they provide density, size, and cost benefits. However, a few precautions are necessary to protect these devices from mechanical damage during transportation and storage.

*Note:* All lidless flip chip and wire bond packages are non-vented packages. All other flip chip packages are vented packages.

## 1.1. Handling J-Lead and QFP Devices

To protect device leads and ensure proper operation, you must handle J-Lead and QFP devices carefully when they are stored, shipped, and transferred. You must store and ship J-Lead devices in tubes sealed with stoppers. Add foam inside the tubes for cushioning if necessary.

You must ship QFP devices in carriers only inside tubes sealed with stoppers and with foam (if necessary). Carriers are static-dissipative, molded plastic shells that hold QFP devices in a secure frame to prevent mechanical damage to device leads. You can program and erase these QFP devices inside carriers and they can tolerate the 125°C baking required for dry packing. When handling QFP devices in carriers, do not touch the QFP device; only use fingers cots to touch the carrier.

If you are required to insert a QFP device into a carrier, contact Intel® Customer Marketing. For more information, refer to the *QFP Carrier and Development Socket Datasheet* as listed in the Related Information section.

You must store and ship QFP devices without carriers, QFP devices that have been extracted from carriers, and BGA devices only in trays sealed with straps. When extracting QFP devices from a carrier, use only Intel QFP extraction tools and inspect the orientation and lead integrity of the devices. You must extract the device and place them directly into trays.

**Related Information**

- QFP Carrier and Development Socket Datasheet
  Provides more details on QFP carriers.
- Trays for QFP, BGA, FBGA, and Lidless FBGA Devices without Carriers on page 7
  Provides more details about handling QFP or BGA devices without carriers.

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- Straps for QFP, BGA, FBGA, and Lidless FBGA Devices without Carriers on page 14
  Provides more details about handling QFP or BGA devices without carriers.

## 1.1.1. Tubes for J-Lead Devices and QFP Devices in Carriers

Intel-approved tubes protect J-Lead and QFP devices in carriers from electrostatic discharge (ESD) and during transportation and storage. Use clear tubes to inspect the top-side marking of the contents easily. The tube material must be antistatic (with "antistatic" printed on the tube), and stiff enough to prevent the tubes from warping, cracking, or developing burrs during normal handling.

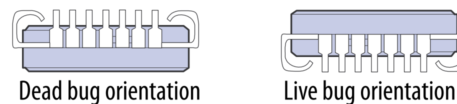
When transporting or storing devices in tubes, follow these guidelines:

- Keep tubes horizontal
- Keep devices in "dead bug" orientation (refer to the *Dead Bug Versus Live Bug Orientation* figure)
- Ensure that the devices do not overlap inside the tube

The following figure shows the difference between a "dead bug" and "live bug" orientation.

The following figure shows the tube dimensions required for each J-Lead device. The tubes must match the dimensions of the device. For the tube dimension, refer to the *Tube Dimension for J-Lead Device Antistatic Shipping Tube* table.

**Figure 1. Dead Bug Versus Live Bug Orientation**




The following table lists the tube dimension as shown in the *Tube Dimensions for J-Lead Device Antistatic Shipping Tube* figure.

**Figure 2. Tube Dimensions for J-Lead Device Antistatic Shipping Tube**

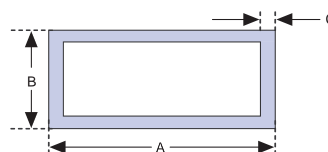



**Table 1. Tube Dimension for J-Lead Device Antistatic Shipping Tube**

| Pin Count | A | B | C | Shipping Length |
|---|---|---|---|---|
| 20 | 0.480 | 0.260 | 0.025 | 20.00 |
| 28 | 0.580 | 0.260 | 0.025 | 20.00 |
| 44 | 0.780 | 0.260 | 0.025 | 20.25 |
| 68 | 1.100 | 0.280 | 0.035 | 20.00 |
| 84 | 1.300 | 0.280 | 0.035 | 20.25 |

The following table lists the part numbers for Intel-approved tubes for J-Lead devices.

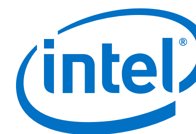


**Table 2. Antistatic Tube Part Numbers for J-Lead Devices**

For more information about how to order tubes, refer to the *Intel-Approved Packing Media and Suppliers* table as listed in the Related Information section.

| Pin Count | Intel Reference Part Number | Tube Capacity (Devices) |
|---|---|---|
| 20 | E20-03708-00 | 49 |
| 28 | E20-02078-00 | 39 |
| 44 | E20-05952-00 | 26 |
| 68 | E20-04431-00 | 18 |
| 84 | E20-04740-00 | 15 |

The following table lists the part numbers for Intel-approved tubes for QFP devices in carriers.

**Table 3. Intel-Approved Tubes for QFP Devices in Carriers**

For more information about how to order tubes, refer to the *Intel-Approved Packing Media and Suppliers* table as listed in the Related Information section.

| Pin Count | Package Dimensions (mm) | Tube Capacity (QFP Devices in Carriers) | Intel Reference Part Number |
|---|---|---|---|
| 100 | 14 x 20 | 23 | E20-02080-00 |
| 160 | 28 x 28 | 14 | E20-04743-00 |
| 208 | 28 x 28 | 14 | E20-04743-00 |
| 240 | 32 x 32 | 12 | E20-04800-00 |
| 304 | 40 x 40 | 10 | E20-04783-00 |

**Related Information**

- Ordering Information on page 22
- Transferring Devices Between Tubes on page 15

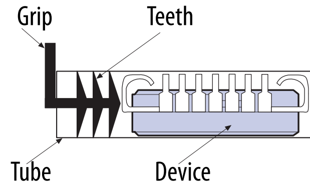
## 1.1.2. Stoppers for J-Lead and QFP Devices in Carriers

Stoppers seal tubes and protect J-Lead and QFP devices in carriers against mechanical damage and ESD. Intel uses black stoppers that match the tube dimensions. When inserting stoppers, follow these guidelines:

- Before transporting or storing devices, seat stoppers firmly into both ends of the tube.
- For easy removal, push stopper teeth fully inside the tube, with the grip extending outside. Do not insert the stopper completely inside the tube (refer to the *Stopper Properly Inserted into a Tube* figure).
- To prevent devices from moving inside an incompletely filled tube, insert foam between the parts and stopper.

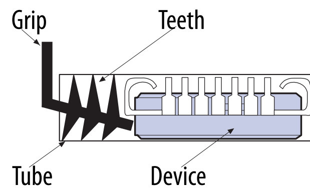
The following figure shows how you can properly insert a stopper in a tube.

### Figure 3. Stopper Properly Inserted into a Tube




To reduce the risk of damaging leads, some special stoppers are designed to fit into a tube in only one way. It is important to insert these special stoppers correctly with the grip in the same direction as the leads, as shown in the following figure.

### Figure 4. Proper Orientation of Special Stoppers




The following table lists the part numbers for Intel-approved black stoppers for J-Lead devices.

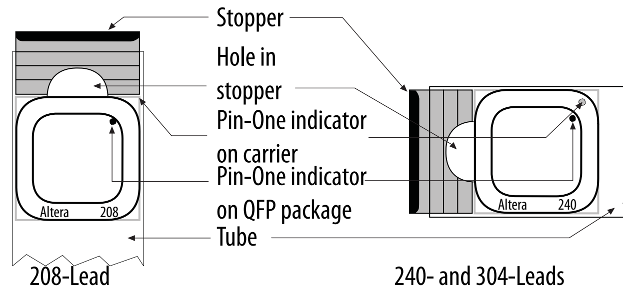
### Table 4. Black Stopper Part Numbers for J-Lead Devices

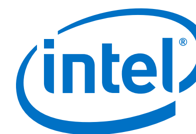
For more information about how to order stoppers, refer to the *Intel-Approved Packing Media and Suppliers* table as listed in the Related Information section.

| Pin Count | Manufacturer Part Number |
|---|---|
| 20 | K-VT0236-25 |
| 28 | K-VT0236-12 |
| 44 | KBR-044 |
| 68 | KBR-068 |
| 84 | KBR-084 |

To prevent damage to leads during shipping, tubes containing 208-, 240-, and 304-lead Power Quad Flat Pack (RQFP) packages in carriers must have modified stoppers. These modified stoppers are used just like other stopper although they have a notch cut out of them, refer to the following figure.

### Figure 5. Notched Stoppers for Tubes of RQFPs in Carriers





The following table lists the part numbers for Intel-approved black stoppers for QFP devices in carriers.

**Table 5. Black Stopper Part Numbers for QFP Devices in Carriers**

For more information about how to order stoppers, refer to the *Intel-Approved Packing Media and Suppliers* table as listed in the Related Information section.

| Pin Count | Intel Part Number |
|---|---|
| 100 | E20-04739-00 |
| 160 | E20-04764-00 |
| 208 | E20-04764-00 |
| 240 | E20-04765-00 |
| 304 | E20-04766-00 |

**Related Information**

Ordering Information on page 22

## 1.1.3. Foam for J-Lead Devices and QFP Devices in Carriers

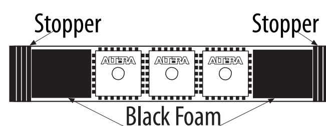
Foam provides extra cushioning and restricts movement inside the tube to prevent device pins from bending. To support the devices evenly, the foam must be nearly as wide as the tubes. You must not use foam in any full tube containing special stoppers, as shown in the Proper Orientation of Special Stoppers figure. When you use the foam, place the foam at each end of the tube between the stoppers and devices, as shown in the following figure.

Foam must be antistatic, non-corrosive, and free of contaminants. Place foam in tubes containing the following:

- A gap inside the tube measuring 1/4 inch or greater (for both J-Lead and QFP devices in carriers)
- Plastic J-Lead Chip Carrier (PLCC) devices with 44 or more pins (full tubes containing PLCC devices with 28 or fewer pins generally do not require foam)
- Ceramic J-Lead Chip Carrier (JLCC) devices

The following figure shows the position of the stopper, foam, and devices in a tube.

**Figure 6. Stoppers, Foam, and Devices in a Tube**




**Related Information**

Stoppers for J-Lead and QFP Devices in Carriers on page 5

## 1.1.4. Trays for QFP, BGA, FBGA, and Lidless FBGA Devices without Carriers

To hold QFP devices without carriers or BGA devices, use only Intel-approved trays as listed in the Intel-Approved Low-Profile Trays Part Number table.

When stacking trays for transportation or storage, follow these guidelines:

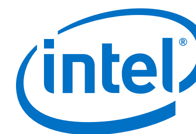
- Seal stacks of trays with straps.
- Ensure that all trays are of the same revision. The revision is indicated by the letter following “Rev”.
- Align all pin-one chamfers on the trays together, as shown in the Properly-Aligned Peak Trays figure.
- Align trays and ensure that they are seated properly before strapping them together.
- Stack RQFP trays no higher than five trays (for example, four trays containing devices and one cover tray).
- Stack Plastic Quad Flat Pack (PQFP) and BGA trays no higher than seven trays ☐ (for example, six trays containing devices and one cover tray).
- Shipping trays used for shipment of QFP and BGA (including FBGA, and lidless FBGA) packages must be low profile.
- Shipping trays used for shipment of Pin-Grid Array (PGA) packages must be high profile.

The following figure shows an example of a properly-aligned peak trays.

**Figure 7. Properly-Aligned Peak Trays**

All the full-size JEDEC trays used by Intel can withstand temperatures of at least 150°C, or you can also refer to the maximum rated temperature marked on each tray. These heat-resistant trays are not only more rigid, but they endure baking at 125°C, which is the recommended temperature for dehydrating moisture-sensitive devices.

The following table lists the part number for Intel-approved, low-profile trays.



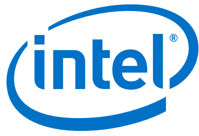
## Table 6. Intel-Approved Low-Profile Trays Part Number

This can either be an eight for 180ºC bakeable trays, six for 150ºC bakeable trays, or 13 for 140ºC bakeable trays.

| Package Type | Package Code | Lead Count | Body Size (mm) | Remark | Primary Supplier | | | Parts or Tray |
|---|---|---|---|---|---|---|---|---|
| | | | | | Vendor and Vendor Part Number | Tray Revision | Intel Part Number | |
| BGA | B | 225 | 27 x 27 | Plastic BGA | Daewon 125-2727-9XX (1) | A | E20-12211-00 | 40 |
| | | 225 | 27 x 27 | Ceramic BGA | R.H. Murphy # RHM-672 | — | E20-03554-03 | 40 |
| | | 256 | 27 x 27 | — | Daewon 125-2727-9XX (1) | A | E20-12211-00 | 40 |
| | | 356 | 35 x 35 | FineLine BGA Package thickness of ~2.2mm | Daewon 125-3535-9XX (1) | E | E20-12214-00 | 24 |
| | | 600 | 45 x 45 | — | Daewon 12Y-4545-4XX (1) | A | E20-12216-00 | 12 |
| | | 652 | 45 x 45 | Wire Bond | Daewon 12Y-4545-4XX (1) | A | E20-12216-00 | 12 |
| | | 652 | 45 x 45 | Flip Chip | KOSTAT KS-880351 | ORIG | E20-33170-00 | 12 |
| | | 672 | 35 x 35 | FineLine BGA Package thickness of ~2.2mm | Daewon 125-3535-9XX (1) | E | E20-12214-00 | 24 |
| | | 672 | 35 x 35 | Flip Chip BGA Package thickness >2.2mm | Daewon T0809050 | A | E20-33149-00 | 24 |
| | | 724 | 35 x 35 | Flip Chip BGA Package thickness >2.2mm | Daewon T0809050 | A | E20-33149-00 | 24 |
| | | 956 | 40 x 40 | — | KOSTAT KS-886H | 02 | E20-33129-00 | 21 |
| FineLine BGA | F | 100 | 11 x 11 | — | Daewon 12F-1111-1XX (1) | A | E20-12205-00 | 176 |
| | | 144 | 13 x 13 | — | Daewon 1F3-1313-DXX (1) | A | E20-12206-00 | 160 |
| | | 169 | 14 x 14 | — | KOSTAT KS-88088 | 00 | E20-15430 | 119 |

*continued...*

(1) "XX represents Daewon temperature category. Must be 19 for 150ºC bakeable trays.

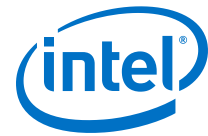




| Package Type | Package Code | Lead Count | Body Size (mm) | Remark | Primary Supplier | | | Parts or Tray |
|---|---|---|---|---|---|---|---|---|
| | | | | | Vendor and Vendor Part Number | Tray Revision | Intel Part Number | |
| | | 256 | 17 x 17 | — | Daewon 1F1-1717-AXX [1] | A | E20-12207-00 | 90 |
| | | 324 | 19 x 19 | — | Daewon 12U-1919-GXX [1] | A | E20-12208-00 | 84 |
| | | 400 | 21 x 21 | — | KOSTAT KS-880104 | ORIG | E20-08843-03 | 60 |
| | | 484 | 23 x 23 | FineLine BGA Package thickness of ~2.5mm | Daewon 12Y-2323-9XX [1] | A | E20-12209-00 | 60 |
| | | 484 | 23 x 23 | Flip Chip BGA Package thickness of ~3.5mm | Daewon 12V-2323-419 | A | E20-12210-00 | 60 |
| | | 484 | 23 x 23 | OMPAC PFBGA (Conventional and Pin Gate) | Daewon T0812012 | B | E20-33269-00 | 60 |
| | | 572 | 25 x 25 | — | Daewon 14Y-2525-119 | A | E20-33190-00 | 44 |
| | | 672 | 27 x 27 | Flip Chip BGA Package thickness >2.2mm | Daewon 12V-2727-319 | B | E20-12212-00 | 40 |
| | | 672 | 27 x 27 | FineLine BGA Package thickness </ =2.2mm and OMPAC PFBGA (Conventional and Pin Gate) | Daewon 125-2727-9XX [1] | A | E20-12211-00 | 40 |
| | | 780 | 29 x 29 | Flip Chip | KOSTAT KS-88085 | ORIG | E20-07373-03 | 36 |
| | | 780 | 29 x 29 | OMPAC (Wirebond PBGA) and Lidless Flip Chip [2] | KOSTAT KS-880466 | A | E20-33329-00 | 36 |
| | | 780 | 29 x 29 | FCmBGA Flip Chip | Daewon 1F1-2929-C19 | B | E-20-33349-00 | 36 |
| | | 896 | 31 x 31 | OMPAC PFBGA (Conventional and Pin Gate) | KOSTAT KS-880120 | 01 | E20-11290-00 | 27 |
| | | 1020 | 33 x 33 | — | Daewon 12Y-3333-4XX [1] | A | E20-12213-00 | 24 |

*continued...*

(2) These packages have lidless package tray offering.



| Package Type | Package Code | Lead Count | Body Size (mm) | Remark | Primary Supplier | | | Parts or Tray |
|---|---|---|---|---|---|---|---|---|
| | | | | | Vendor and Vendor Part Number | Tray Revision | Intel Part Number | |
| | | 1152 | 35 x 35 | Flip Chip BGA Package thickness >2.2mm | Daewon T0809050 | A | E20-33149-00 | 24 |
| | | 1152 | 35 x 35 | Lidless Flip Chip (2) | Daewon 125-3535-9XX (1) | E | E20-12214-00 | 24 |
| | | 1508 | 40 x 40 | — | KOSTAT KS-886H | 02 | E20-33129-00 | 21 |
| | | 1510 | 40 x 40 | Lidded Flip Chip | KOSTAT KS-886H | 02 | E20-33129-00 | 21 |
| | | 1517 | 40 x 40 | — | KOSTAT KS-886H | 02 | E20-33129-00 | 21 |
| | | 1760 | 42.5 x 42.5 | — | KOSTAT KS-880350 | ORIG | E20-33169-00 | 12 |
| | | 1932 | 45 x 45 | — | KOSTAT KS-880351 | ORIG | E20-33170-00 | 12 |
| Hybrid BGA (HBGA) | H | 484 | 27 x 27 | Flip Chip BGA Package thickness >2.2mm | Daewon 12V-2727-319 | B | E20-12212-00 | 40 |
| | | 780 | 33 x 33 | — | Daewon 12Y-3333-4XX (1) | A | E20-12213-00 | 24 |
| | | 1152 | 40 x 40 | — | KOSTAT KS-886H | 02 | E20-33129-00 | 21 |
| | | 1152 | 42.5 x 42.5 | — | KOSTAT KS-880350 | ORIG | E20-33169-00 | 12 |
| | | 1517 | 42.5 x 42.5 | — | KOSTAT KS-880350 | ORIG | E20-33169-00 | 12 |
| | | 1517 | 45 x 45 | — | KOSTAT KS-880351 | ORIG | E20-33170-00 | 12 |
| | | 1760 | 45 x 45 | — | KOSTAT KS-880351 | ORIG | E20-33170-00 | 12 |
| Micro BGA (MBGA) | M | 64 | 4.5 x 4.5 | — | Daewon 14C-4545-D19 | A | E20-33289-00 | 490 |
| | | 68 | 5 x 5 | — | KOSTAT KS-880203 | 00 | E20-33230-00 | 640 |
| | | 100 | 6 x 6 | — | KOSTAT KS-88090 | 00 | E20-33007-00 | 429 |
| | | 144 | 7 x 7 | — | Daewon 12U-0707-9XX (1) | A | E20-12204-01 | 416 |
| | | 153 | 8 x 8 | — | Daewon 1F3-0808-119 | A | E20-33229-00 | 348 |

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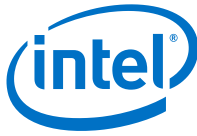
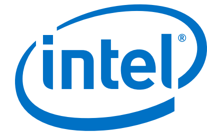




| Package Type | Package Code | Lead Count | Body Size (mm) | Remark | Primary Supplier | | | Parts or Tray |
|---|---|---|---|---|---|---|---|---|
| | | | | | Vendor and Vendor Part Number | Tray Revision | Intel Part Number | |
| | | 164 | 8 x 8 | Lidless Flip Chip (2) | Daewon 1F3-0808-119 | A | E20-33229-00 | 348 |
| | | 256 | 9 x 9 | — | ePAK eTR0121-54 (eN BG0909 1.5 1026 54) | 0 | E20-33353-00 | 260 |
| | | 256 | 11 x 11 | — | Daewon 12F-1111-1XX (1) | A | E20-12205-00 | 176 |
| | | 301 | 11 x 11 | — | Daewon 12F-1111-1XX (1) | A | E20-12205-00 | 176 |
| | | 383 | 13 x 13 | — | KOSTAT KS-880432 | 00 | E20-33355-00 | 119 |
| | | 484 | 15 x 15 | — | KOSTAT KS-870369 | 00 | E20-33350-00 | 119 |
| | | 1019 | 17 x 17 | — | Daewon 1F1-1717-AXX (1) | A | E20-12207-00 | 90 |
| Quad Flat No-Lead (QFN) | N | 148 | 11 x 11 | — | Kostat KS-870324 | A | E20-33249-00 | 176 |
| Ultra FineLine BGA (UBGA) | U | 49 | 7 x 7 | — | Daewon 12U-0707-9XX (1) | A | E20-12204-01 | 416 |
| | | 88 | 8 x 11 | — | Shinon SL-BG081115TJ-1 | ORIG | E20-09743-03 | 210 |
| | | 169 | 11 x 11 | — | Daewon 12F-1111-1XX (1) | A | E20-12205-00 | 176 |
| | | 256 | 14 x 14 | — | Kostat KS-88088 | 00 | E20-15430 | 119 |
| | | 324 | 15 x 15 | — | KOSTAT KS-870369 | 00 | E20-33350-00 | 119 |
| | | 358 | 17 x 17 | Lidless Flip Chip (2) | Daewon 1F1-1717-AXX (1) | A | E20-12207-00 | 90 |
| | | 484 | 19 x 19 | — | Daewon 12U-1919-GXX (1) | A | E20-12208-00 | 84 |
| | | 672 | 23 x 23 | OMPAC PFBGA (Conventional & Pin Gate) | Daewon T0812012 | B | E20-33269-00 | 60 |
| Thin Quad Flat Pack (TQFP)/ Plastic Enhance | T/E | 32 (TQFP only) | 7 x 7 | — | KS-86015 | 00 | E20-07179-03 | 250 |
| | | 44 | 10 x 10 | — | KS-8607 | 02 | E20-07193-03 | 160 |
| | | 64 (EQFP only) | 7 x 7 | — | KS-86015 | 00 | E20-07179-03 | 250 |

*continued...*



| Package Type | Package Code | Lead Count | Body Size (mm) | Remark | Primary Supplier | | | Parts or Tray |
|---|---|---|---|---|---|---|---|---|
| | | | | | Vendor and Vendor Part Number | Tray Revision | Intel Part Number | |
| d Quad Flat Pack (EQFP) | | 100 | 14 x 14 | — | KS-8605 | 00 | E20-07194-03 | 90 |
| | | 144 | 20 x 20 | — | KS-8303 | 03 | E20-07195-03 | 60 |
| PQFP | Q | 44 | 10 x 10 | — | Daewon 121-1010-3XX (1) | A | AE20-12227-0 0 | 96 |
| | | 100 | 14 x 20 | — | Kostat KS-8212 | 03 | E20-05239-03 | 66 |
| | | 100 | 14 x 20 | PQFP parts assembled by Sharp-JAPAN must use Rev.6P | Peak ND-1420-2.7-0 611- 6P | 6P | E20-09907-00 | 66 |
| | | 160 | 28 x 28 | — | Kostat KS-8201 | 10 | E20-05240-03 | 24 |
| | | 208 | 28 x 28 | — | Kostat KS-8201 | 10 | E20-05240-03 | 24 |
| | | 240 | 32 x 32 | — | Kostat KS-8205 | 06 | E20-05241-03 | 24 |
| RQFP | R | 208 | 28 x28 | — | Kostat KS-8201 | 10 | E20-05240-03 | 24 |
| | | 240 | 32 x 32 | — | Kostat KS-8205 | 06 | E20-05241-03 | 24 |
| | | 304 | 40 x 40 | — | Peak ND-4040-3.8-0 206 (3) | ORIG | E20-03552-03 | 12 |
| PGA | G | 68 | 11 x 11 | — | R.H. Murphy # RHM-605 | — | E20-04266-03 | 21 |
| | | 84 | 11 x 11 | — | R.H. Murphy # RHM-605 | — | E20-04266-03 | 21 |
| | | 100 | 13 x 13 | — | R.H. Murphy # RHM-605 | — | E20-04266-03 | 21 |
| | | 160 | 15 x 15 | — | R.H. Murphy # RHM-605 | — | E20-04266-03 | 21 |
| | | 192 | 17 x 17 | — | R.H. Murphy # RHM-601 | — | E20-04217-03 | 10 |
| | | 232 | 17 x 17 | — | R.H. Murphy # RHM-601 | — | E20-04217-03 | 10 |
| | | 280 | 19 x 19 | — | R.H. Murphy # RHM-601 | — | E20-04217-03 | 10 |
| | | 403 | 19 x 19 | Ceramic lid | R.H. Murphy # RHM-620 | — | E20-03556-03 | 10 |

*continued...*

(3) This can either be an eight for 180ºC bakeable trays, six for 150ºC bakeable trays, or 13 for 140ºC bakeable trays.

| Package Type | Package Code | Lead Count | Body Size (mm) | Remark | Primary Supplier | | | Parts or Tray |
|---|---|---|---|---|---|---|---|---|
| | | | | | Vendor and Vendor Part Number | Tray Revision | Intel Part Number | |
| | | 403 | 19 x 19 | Gold lid | R.H. Murphy # RHM-750 | — | E20-03563-03 | 8 |
| | | 503 | 22 x 22 | — | R.H. Murphy # RHM-750 | — | E20-03563-03 | 8 |
| | | 599 | 24 x 24 | — | R.H. Murphy # RHM-750 | — | E20-03563-03 | 8 |

## 1.1.5. Straps for QFP, BGA, FBGA, and Lidless FBGA Devices without Carriers

Straps secure trays and prevent devices from jostling during transportation and storage. To hold trays together during transportation, Intel recommends using at least 1/2-inch wide polypropylene straps that can withstand temperatures up to 130°C in case you are required to bake the devices before mounting. When storing devices, Intel recommends using either velcro or polypropylene straps.

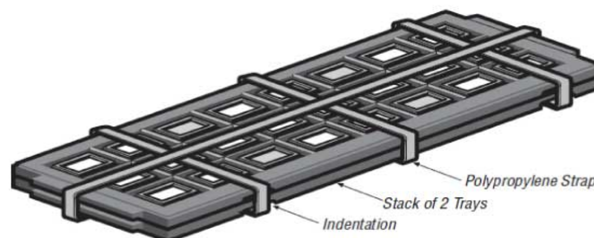
Velcro straps that are 20 inches in length are sufficiently long to bind stacks of two to seven trays for storage. When you strap trays together for shipping, follow these guidelines:

- Use only heat-sealed polypropylene straps. Although velcro straps can hold trays together during storage, they lack the strength required to hold trays during transportation.
- Set the tension on the strapping machine high enough to prevent straps from sliding off a stack of trays.
- Secure one polypropylene strap across the length of the tray.
- Remove straps with a knife to prevent jostling devices in the trays.

*Note:* Do not use rubber bands, masking tape, string, or other similar material in place of velcro or polypropylene straps.

The following figure shows the proper way to secure polypropylene straps on a stack of trays.

**Figure 8. Properly Secured Polypropylene Straps on a Stack of Trays**



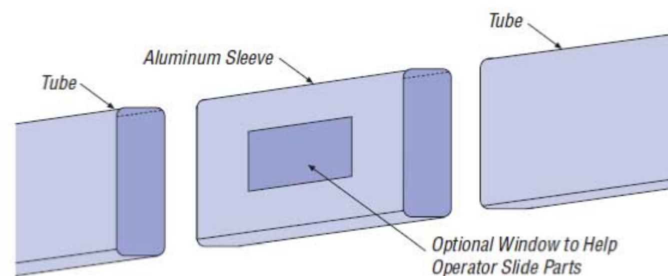
## 1.2. Transferring Devices Between Tubes

To prevent leads from bending on tube edges, follow these steps when transferring J-Lead devices and QFP devices in carriers from one tube to another:

1. Use a metal or plastic sleeve to line up tube ends. If you do not have a sleeve, carefully line up the tube ends.
2. Tilt the tubes so that the devices slide from one tube to the other. Do not shake or vibrate the tubes.

The following figure shows the sleeve for tube-to-tube transfer.

**Figure 9. Sleeve for Tube-to-Tube Transfer**




## 1.3. Transferring QFP, BGA, FBGA, and Lidless FBGA Devices Without Carriers Between Trays

Intel recommends using automated pick-and-place machines in an ESD-protected environment to transfer QFP or BGA devices between trays. If you are required to transfer these devices manually, follow these guidelines:

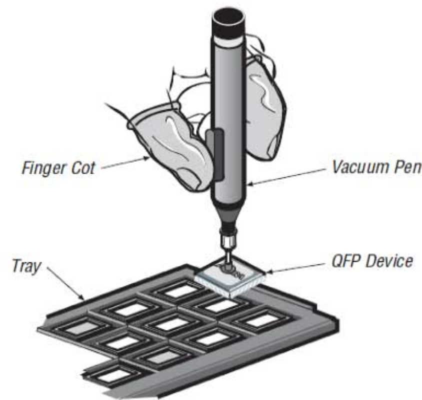
- Work in an ESD-protected environment.
- Use ground straps and finger cots.
- Use only vacuum pens to transfer QFP or BGA devices manually. Vacuum pens must be able to maintain their vacuum for at least four seconds.
- Transfer devices right-side-up over a table, then release the vacuum only after the device is oriented and seated in the tray properly.
- Do not allow QFP device leads to contact the tray.

For transferring lidless FBGA devices, follow these guidelines:

- Ensure that you use vacuum pens with soft rubber tips.
- Ensure that the vacuum pen does not touch the edge of the exposed die.
- Ensure that the vacuum tip covers the die area without losing any suction.
- Intel recommends that you use Intel-specified trays for lidless flip chip. For more information, refer to the *Intel-Approved Low-Profile Trays Part Number* table as listed in the Related Information section.

The following figure shows how you can transfer a QFP device with a vacuum pen.

**Figure 10. Transferring a QFP Device with a Vacuum Pen**




**Related Information**

Trays for QFP, BGA, FBGA, and Lidless FBGA Devices without Carriers on page 7

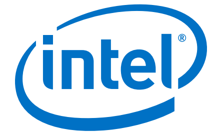
## 1.4. Dry Packing J-Lead, QFP, BGA, FBGA, and Lidless BGA Devices

Dry packing is a method of packing moisture-sensitive devices for shipment. Risk to moisture-sensitive devices can occur when the high-soldering temperatures of the reflow process suddenly heat any moisture absorbed by a plastic package. Although many of Intel devices are not sensitive to moisture, Intel adopted dry packing as a standard practice for moisture-sensitive devices to eliminate all risk of moisture. Additionally, Intel can dry-pack other devices upon request. During dry packing, devices are first baked to remove any existing moisture and then packed and vacuum-sealed in moisture-barrier bags.

The following table lists the contents of a typical package.

**Table 7. Dry Pack Contents**

| Item | Specification |
| --- | --- |
| Moisture-barrier bag | MIL-B-81705C, Type I or equivalent |
| Desiccant | MIL-D-3464, Type II or equivalent |
| Humidity-indicator card | Compliant with MIL-I-8835A |
| Labels | ID label and caution label |



To maintain a moisture-free environment, follow these guidelines after receiving dry-packed devices from Intel:

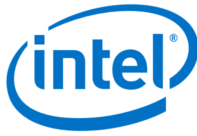
- Open bags as close to the seal as possible to leave enough of the bag for resealing.
- Reseal bags after opening to minimize exposure to moisture.
- Inspect all dry packs for potential leaks in the seals or bags. If a leak exists and the humidity-indicator card shows an unacceptable humidity level (for example, the 20% dot has started to turn pink), rebake the devices. If a leak exists but the humidity-indicator shows an acceptable humidity level (for example, the 20% dot is blue with no pink), reseal the devices in an undamaged bag.
- Check that the humidity-indicator card shows acceptable humidity after opening dry packs. If the card shows an unacceptable humidity level, rebake the devices.
- Store dry packs in condition less than 40°C and less than 90% relative humidity.

In addition, Intel lists the floor life on every dry-pack label. The floor life is the length of time you can expose a device to a factory environment (less than 30°C and less than 60% relative humidity) after you removed the device from the bag and before it is mounted. Parts that are not dry packed have an unlimited floor life but you must store at a proper environment (less than 30°C and less than 85% relative humidity). If the interval between opening a dry pack and mounting the devices onto a board exceeds the floor life of the device, rebake devices prior to mounting.

Distributors have an additional allotment of time beyond the labeled floor life. Six hours are available for products with a 24-hour floor life, and 24 hours are available for products with a 168-hour or one-year floor life. These time allotments allow for programming and repacking as required.

When dry-packing devices, follow these guidelines:

- When transferring parts to new dry pack bags, operators must remember to copy the floor life and expiration date accurately to the new dry-pack labels.
- Bake QFP or BGA devices in strapped heat-resistant trays at 125°C for at least 12 hours.
- Bake J-Lead devices in heat-resistant tubes at 125°C for at least 12 hours. If you lack heat-resistant tubes, bake J-Lead devices on a cookie sheet in a dead-bug orientation.
- Use heat-sealed bags that are resistant to punctures and abrasion.
- Use foam covers or bubble wrap around a stack of trays inside the moisture-barrier bag to avoid punctures.
- Seal bags with a vacuum-operated bag-sealing machine. Relax the vacuum enough to prevent the tube or tray from puncturing the bag.
- If the dry pack is open for longer than one hour, replace the desiccant and humidity indicator card.
- Use at least one unit of desiccant per dry pack.
- You must not use zip-lock and dry-pack bags for longer than one week.





### 1.4.1. Dry Pack Sizes

The following table lists the available dry pack sizes. Intel uses heavy-duty, 6" x 24", 6" x 30", and 10" x 30" bags for dry-packing tubes. Bags for trays by Intel are 10" x 20".

**Table 8. Dry Pack Sizes**

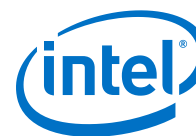
- The tray quantities do not include one cover tray.
- For the dry-packed devices in Tube 2, foam sheets are used at the bottom of the tube box.
- To optimize the material and space usage, the box and foam sizes are "recommended only".
- If bubble wrap is used inside the moisture bag, follow the "2-feet bubble" recommendation. This is applicable only for all dry-packed devices.
- J44 = 100% Pack 2.
- L20DP, L28DP, S08/16, TR = 100% Pack 3.
- No Pack 3 for all PGAs.
- Pack 1 and Pack 2 are in jewellery boxes.

| Package and Lead | "Quantity/ Primary Container" | Type of Container | Minimum Container | Quantity | Maximum Container | Quantity |
|---|---|---|---|---|---|---|
| B225 | 40 | TRAY | 1 | 40 | 6 | 240 |
| B256 | 40 | TRAY | 1 | 40 | 6 | 240 |
| B356 | 24 | TRAY | 1 | 24 | 4 | 96 |
| B600 | 12 | TRAY | 1 | 12 | 6 | 72 |
| B652 | 12 | TRAY | 1 | 12 | 4 | 48 |
| B672 | 24 | TRAY | 1 | 24 | 3 | 72 |
| B724 | 24 | TRAY | 1 | 24 | 3 | 72 |
| B956 | 21 | TRAY | 1 | 21 | 3 | 63 |
| D08 | 50 | TUBE | 1 | 50 | N/A | N/A |
| D10 | 1000 | REEL | N/A | N/A | 1 | 1000 |
| D12 | 1000 | REEL | N/A | N/A | 1 | 1000 |
| D20 | 20 | TUBE | 10 | 200 | N/A | N/A |
| D24 | 15 | TUBE | 8 | 120 | 48 | 720 |
| D28 | 13 | TUBE | 5 | 65 | 45 | 585 |
| D36 | 500 | REEL | 1 | 500 | 2 | 1000 |
| D36TR | 500 | REEL | 1 | 500 | 2 | 1000 |
| D40 | 10 | TUBE | 5 | 50 | 40 | 400 |
| E144 | 60 | TRAY | 1 | 60 | 6 | 360 |
| E64 | 250 | TRAY | 1 | 250 | 6 | 1500 |
| F100 | 176 | TRAY | 1 | 176 | 6 | 1056 |
| F1020 | 24 | TRAY | 1 | 24 | 3 | 72 |
| F1152 | 24 | TRAY | 1 | 24 | 3 | 72 |
| F144 | 160 | TRAY | 1 | 160 | 6 | 960 |

*continued...*



Send Feedback



| Package and Lead | "Quantity/ Primary Container" | Type of Container | Minimum Container | Quantity | Maximum Container | Quantity |
|---|---|---|---|---|---|---|
| F1508 | 21 | TRAY | 1 | 21 | 3 | 63 |
| F1510 | 21 | TRAY | 1 | 21 | 3 | 63 |
| F1517 | 21 | TRAY | 1 | 21 | 3 | 63 |
| F169 | 119 | TRAY | 1 | 119 | 6 | 714 |
| F1760 | 12 | TRAY | 1 | 12 | 4 | 48 |
| F1932 | 12 | TRAY | 1 | 12 | 4 | 48 |
| F1933 | 12 | TRAY | 1 | 12 | 4 | 48 |
| F24 | 187 | TRAY | 1 | 187 | 5 | 935 |
| F256 | 90 | TRAY | 1 | 90 | 6 | 540 |
| F324 | 84 | TRAY | 1 | 84 | 3 | 252 |
| F33 | 24 | TRAY | 1 | 24 | 3 | 72 |
| F400 | 60 | TRAY | 1 | 60 | 4 | 240 |
| F484 | 60 | TRAY | 1 | 60 | 4 | 240 |
| F484FC | 60 | TRAY | 1 | 60 | 4 | 240 |
| F572 | 44 | TRAY | 1 | 44 | 4 | 176 |
| F672 | 40 | TRAY | 1 | 40 | 4 | 160 |
| F672F35 | 24 | TRAY | 1 | 24 | 3 | 72 |
| F672FC | 40 | TRAY | 1 | 40 | 4 | 160 |
| F780 | 36 | TRAY | 1 | 36 | 4 | 144 |
| F780FC | 36 | TRAY | 1 | 36 | 4 | 144 |
| F896 | 27 | TRAY | 1 | 27 | 3 | 81 |
| G100 | 21 | TRAY | 1 | 21 | N/A | N/A |
| G160 | 21 | TRAY | 1 | 21 | N/A | N/A |
| G192 | 10 | TRAY | 1 | 10 | N/A | N/A |
| G232 | 10 | TRAY | 1 | 10 | N/A | N/A |
| G280 | 10 | TRAY | 1 | 10 | N/A | N/A |
| G403 | 10 | TRAY | 1 | 10 | N/A | N/A |
| G503 | 10 | JEWEL | 1 | 10 | N/A | N/A |
| G599 | 8 | JEWEL | 1 | 8 | N/A | N/A |
| G655 | 8 | JEWEL | 1 | 8 | N/A | N/A |
| G68 | 21 | TRAY | 1 | 21 | N/A | N/A |
| G84 | 21 | TRAY | 1 | 21 | N/A | N/A |
| H1152 | 21 | TRAY | 1 | 21 | 3 | 63 |
| H1152H425 | 12 | TRAY | 1 | 12 | 4 | 48 |
| H1517 | 12 | TRAY | 1 | 12 | 4 | 48 |

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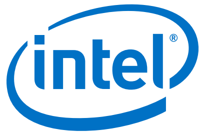



| Package and Lead | "Quantity/ Primary Container" | Type of Container | Minimum Container | Quantity | Maximum Container | Quantity |
|---|---|---|---|---|---|---|
| H1760 | 12 | TRAY | 1 | 12 | 4 | 48 |
| H484 | 40 | TRAY | 1 | 40 | 4 | 160 |
| H780 | 24 | TRAY | 1 | 24 | 3 | 72 |
| J28 | 36 | TUBE | 1 | 36 | 9 | 324 |
| J44 | 26 | TUBE | N/A | N/A | N/A | N/A |
| J68 | 18 | TUBE | 1 | 18 | 10 | 180 |
| J84 | 15 | TUBE | 1 | 15 | 10 | 150 |
| L20 | 49 | TUBE | 4 | 196 | 24 | 1176 |
| L20DP | 49 | TUBE | N/A | N/A | 24 | 1176 |
| L28 | 39 | TUBE | 4 | 156 | 24 | 936 |
| L28DP | 39 | TUBE | N/A | N/A | 24 | 936 |
| L44 | 26 | TUBE | 5 | 130 | 30 | 780 |
| L44DP | 26 | TUBE | 5 | 130 | 30 | 780 |
| L44TR | 500 | REEL | N/A | N/A | 1 | 500 |
| L68 | 18 | TUBE | 3 | 54 | 24 | 432 |
| L84 | 15 | TUBE | 1 | 15 | 15 | 225 |
| L84TR | 200 | REEL | N/A | N/A | 1 | 200 |
| M100 | 429 | TRAY | 1 | 429 | 3 | 1287 |
| M100TR | 3000 | REEL | N/A | N/A | 1 | 3000 |
| M1019TR | 875 | REEL | N/A | N/A | 1 | 875 |
| M144 | 416 | TRAY | 1 | 416 | 3 | 1248 |
| M153 | 348 | TRAY | 1 | 348 | 3 | 1044 |
| M164 | 348 | TRAY | 1 | 348 | 3 | 1044 |
| M256 | 176 | TRAY | 1 | 176 | 6 | 1056 |
| M256M99 | 260 | TRAY | 1 | 260 | 3 | 780 |
| M301 | 176 | TRAY | 1 | 176 | 6 | 1056 |
| M383 | 119 | TRAY | 1 | 119 | 6 | 714 |
| M484 | 119 | TRAY | 1 | 119 | 6 | 714 |
| M64 | 490 | TRAY | 1 | 490 | 3 | 1470 |
| M68 | 640 | TRAY | 1 | 640 | 3 | 1920 |
| N148 | 176 | TRAY | 1 | 176 | 6 | 1056 |
| P08 | 50 | TUBE | 2 | 100 | 12 | 600 |
| P20 | 18 | TUBE | 10 | 180 | 60 | 1080 |
| P24 | 15 | TUBE | 8 | 120 | 48 | 720 |
| P28 | 14 | TUBE | 8 | 112 | 48 | 672 |

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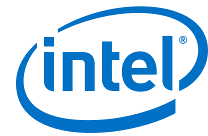
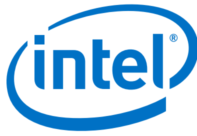


| Package and Lead | "Quantity/ Primary Container" | Type of Container | Minimum Container | Quantity | Maximum Container | Quantity |
|---|---|---|---|---|---|---|
| P40 | 10 | TUBE | 5 | 50 | 40 | 400 |
| Q100 | 66 | TRAY | 1 | 66 | 10 | 660 |
| Q100SH | 50 | TRAY | 1 | 50 | 10 | 500 |
| Q100TR | 1 | REEL | N/A | N/A | 1 | 1 |
| Q132 | 36 | TRAY | 1 | 36 | 6 | 216 |
| Q16 | 1000 | REEL | N/A | N/A | 1 | 1000 |
| Q160 | 24 | TRAY | 1 | 24 | 6 | 144 |
| Q20 | 1000 | REEL | N/A | N/A | 1 | 1000 |
| Q208 | 24 | TRAY | 1 | 24 | 6 | 144 |
| Q24 | 500 | REEL | 1 | 500 | 2 | 1000 |
| Q240 | 24 | TRAY | 1 | 24 | 4 | 96 |
| Q28 | 500 | REEL | N/A | N/A | 1 | 500 |
| Q30 | 500 | REEL | N/A | N/A | 1 | 500 |
| Q36 | 1000 | REEL | N/A | N/A | 1 | 1000 |
| Q38 | 500 | REEL | N/A | N/A | 1 | 500 |
| Q40 | 1000 | REEL | N/A | N/A | 1 | 1000 |
| Q44 | 96 | TRAY | 1 | 96 | 6 | 576 |
| Q44TR | 500 | REEL | N/A | N/A | 1 | 500 |
| Q46 | 1000 | REEL | N/A | N/A | 1 | 1000 |
| Q54 | 250 | REEL | N/A | N/A | 1 | 250 |
| Q58 | 250 | REEL | N/A | N/A | 1 | 250 |
| Q68 | 250 | REEL | 1 | 250 | 2 | 500 |
| Q76 | 250 | REEL | N/A | N/A | 1 | 250 |
| Q92 | 250 | REEL | N/A | N/A | 1 | 250 |
| R144 | 60 | TRAY | 1 | 60 | 4 | 240 |
| R208 | 24 | TRAY | 1 | 24 | 4 | 96 |
| R240 | 24 | TRAY | 1 | 24 | 4 | 96 |
| R304 | 12 | TRAY | 1 | 12 | 4 | 48 |
| S08 | 100 | TUBE | N/A | N/A | 20 | 2000 |
| S14 | 1000 | REEL | N/A | N/A | 1 | 1000 |
| S16 | 49 | TUBE | N/A | N/A | 25 | 1225 |
| S20 | 38 | TUBE | 1 | 38 | 9 | 342 |
| S24 | 31 | TUBE | 1 | 31 | 9 | 279 |
| S28 | 27 | TUBE | 1 | 27 | 9 | 243 |
| S8 | 1000 | REEL | N/A | N/A | 1 | 1000 |

*continued...*





| Package and Lead | "Quantity/ Primary Container" | Type of Container | Minimum Container | Quantity | Maximum Container | Quantity |
|---|---|---|---|---|---|---|
| T100 | 90 | TRAY | 1 | 90 | 6 | 540 |
| T100TR | 1000 | REEL | N/A | N/A | 1 | 1000 |
| T14 | 1000 | REEL | N/A | N/A | 1 | 1000 |
| T144 | 60 | TRAY | 1 | 60 | 6 | 360 |
| T32 | 250 | TRAY | 1 | 250 | 6 | 1500 |
| T44 | 160 | TRAY | 1 | 160 | 6 | 960 |
| U14 | 1000 | REEL | N/A | N/A | 1 | 1000 |
| U16 | 1000 | REEL | N/A | N/A | 1 | 1000 |
| U169 | 176 | TRAY | 1 | 176 | 6 | 1056 |
| U16TR | 1000 | REEL | N/A | N/A | 1 | 1000 |
| U256 | 119 | TRAY | 1 | 119 | 6 | 714 |
| U324 | 119 | TRAY | 1 | 119 | 6 | 714 |
| U358 | 90 | TRAY | 1 | 90 | 6 | 540 |
| U484 | 84 | TRAY | 1 | 84 | 3 | 252 |
| U49 | 416 | TRAY | 1 | 416 | 3 | 1248 |
| U672 | 60 | TRAY | 1 | 60 | 4 | 240 |
| U88PK | 210 | TRAY | 1 | 210 | 3 | 630 |
| U88SH | 80 | TRAY | 1 | 80 | 6 | 480 |
| V81 | 1000 | REEL | N/A | N/A | 1 | 1000 |
| W100 | 66 | TRAY | 1 | 66 | 6 | 396 |
| W208 | 24 | TRAY | 1 | 24 | 4 | 96 |

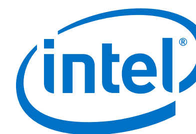
## 1.5. Shipping J-Lead, QFP, BGA, FBGA, and Lidless FBGA Devices in Boxes

When shipping trays or tubes of devices, only use boxes that have passed the ASTM D776 test for shipping containers. To protect against ESD, Intel recommends using boxes with an internal, conductive finish. You must add filler material to boxes to cushion the contents and prevent trays or tubes from shifting position during shipping. Boxes must contain enough filler material to prevent stoppers from falling out of tubes when jostled. Filler material must meet the following standards:

- Must be antistatic and non-corrosive
- Must not crumble, flake, powder, outgas, or shed
- Must not scratch or puncture the trays, tubes, or dry-pack bags

## 1.6. Ordering Information

The following table lists Intel-approved packing media and suppliers.



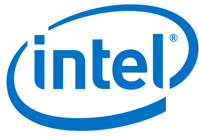
| Material | Suppliers |
| --- | --- |
| Tubes and stoppers | Intel |
| Trays (QFPs and BGAs) | Kostat |
| | Daewon |
| Trays (PGAs) | R.H Murphy |
| ESD velcro straps | Com-Kyl |
| 0.5”-wide, polypropylene, heat-sealed straps (E30-04766) | South Bay Packaging |
| Tray-strapping machines (using polypropylene, heat-sealed straps) or other dry-packing equipment | Kent Lansdberg<br>StraPack (Sivaron Model S-699, D-52, and AQ-7) |
| Foam packaging (foam filler) | Pacific Southwest Container |
| Bubble wraps, trays, or dry-packing supplies | Ecotech |
| Vacuum pens | Virtual Industries |

**Related Information**

- Intel
- Kostat
- Daewon
- R. H. Murphy
- Com-Kyl
- South Bay Packaging
- Kent Landsberg
- Pacific Southwest Container
- Ecotech
- Virtual Industries

## 1.7. Document Revision History for AN 71: Guidelines for Handling J-Lead, QFP, BGA, FBGA, and Lidless FBGA Devices

| Document Version | Changes |
| --- | --- |
| 2019.03.29 | • Renamed the document as *AN 071: Guidelines for Handling J-Lead, QFP, BGA, FBGA, and Lidless FBGA Devices*.<br>• Rebranded as Intel. |





## Table 9. Document Revision History

| Date | Version | Changes |
|---|---|---|
| June 2017 | 2017.06.28 | Added a note to clarify that all lidless flip chip and wire bond packages are non-vented packages and all other flip chip packages are vented packages. |
| June 2015 | 2015.06.12 | • Updated the Altera-Approved Low-Profile Trays Part Number table to include the following packages:<br>— FBGA 780 FCmBGA Flip Chip (29 mm x 29 mm)<br>— FBGA 1510 Lidded Flip Chip (40 mm x 40 mm)<br>— HBGA 1517 (45 mm x 45 mm)<br>— HBGA 1760 (45 mm x 45 mm)<br>— MBGA 153 (8 mm x 8 mm)<br>— MBGA 256 (9 mm x 9 mm)<br>— MBGA 301 (11 mm x 11 mm)<br>— MBGA 383 (13 mm x 13 mm)<br>— MBGA 484 (15 mm x 15 mm)<br>— UBGA 324 (15 mm x 15 mm)<br>— UBGA 672 (23 mm x 23 mm)<br>• Updated the Dry Pack Sizes table. |
| January 2011 | 5.0 | • Updated to include lidless FBGA in this document.<br>• Updated Table 6, Table 8, and Table 9.<br>• Minor text edits. |