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External Delivery Instructions for SMD-Components

This instruction contains external rules and instructions for the delivery of SMD components as well as the necessary packing materials and is based on the current valid norms and guidelines as well as the P+F-specific requirements for a process-safe processing in the SMT production process.

1 References, Norms

IEC 60286-3:	Taping and magazining of components for automatic processing - Part 3: Taping of surface-mountable components (IEC 60286-3:1997)
IEC 60286-4	Taping and magazining of components for automatic processing - Part 4: Bar magazine for electronic components with housings of Form E and G (IEC 60286- 4:1997)
IEC 60286-5	Taping and magazining of components for automatic processing - Part 5: Flat magazine (IEC 60286-5:2003)
IEC 60191	Mechanical standardization for semiconductor devices 2001-01-25
ISO 11469	Moulding-marking of thermoplastics
IPC/JEDEC J-STD-020D	Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices
IPC/JEDEC J-STD-033A	Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices
IPC/EIA J-STD-001C	Requirements for Soldered Electrical & Electronic Assemblies*
IPC-A-610D	Acceptability of Electronic Assemblies

The respective latest versions of the references and norms apply.

2 Shelf-Life (based on the Manufacturing Date Code) upon delivery

- The Shelf-Life is based on the Manufacturing Date Code.
The defined storage conditions are listed in Chapter 5
- The following Shelf-Life (based on the Manufacturing Date Code) should not be exceeded upon delivery:
 - **SMD-components with AgPd-metallisation** **6 months**
 - **Other SMD-components** **24 months**

The metallisation used for the connection pads must ensure a faultless solderability / wettability in the sense of J-STD-001C and IPC-A 610D.

3 Component manufacturer specifies components with unlimited shelf life

If a manufacturer specifies an unlimited shelf life for his SMD components, it must be ensured through the supplier that unprocessable / claimed components are replaced free-of-charge at any time through the supplier.

The free-of-charge replacement of claimed SMD components at any time is to be confirmed in writing by the supplier!

4 Marking

The reels/magazines must contain the following markings on a label:

- P+F part number
- Manufacturer part number
- Manufacturer
- Component designation
- Quantity
- Date of manufacture (Date Code)
- Batch number
- ESD-Warning advice
- MS-Level

Generally one reel must contain components of only one date code/batch.

5 Storage conditions

Storage environment: Cool, dry storage place, free of corrosive gas, dust and smoke

Temperature: Minimum 20°C, maximum 26°C (Fluctuation of max. $\pm 2^{\circ}\text{C}$)

Humidity: Minimum 30%RH, maximum 60%RH (Fluctuation of max. $\pm 5\%\text{RH}$)

It is to be ensured that upon audit, the defined storage conditions are adhered to by the manufacturer/distributor.

6 Packing

MSL- (Moisture Sensitivity Level) critical components with an MS-Level ≥ 2 as well as components with a silver-palladium alloy are to be packed MSL-appropriate in MSL bags with desiccator and humidity indicator under vacuum.

The packing must be marked with a label, which contains a marking acc. to Chapter 4. Furthermore, the packing must contain a marking acc. to IPC/JEDEC J-STD-033A.

7 Substrates

It is to be ensured that the substrates do not have destructive influence on packing materials. Sharp edges at substrates can cause damage to Dry-Packs or other packing materials.

The material is not to negatively affect the mechanical and electrical characteristics, solderability of the components or component marking during transport or during a baking process.

7.1 Plastic carrier reel

- Antistatic or conducting plastic (less than $10^{12} \Omega$).

7.2 Paper and blister tape

- Carrier tape - conducting (less than $10^6 \Omega$)
- Cover tape - antistatic (less than $10^{12} \Omega$).
- With non-ESD-risk components, a paper or blister tape can be used.

7.3 Matrix tray

- The material must conform to the ESD requirements of $\geq 1.0 \times 10^5 \Omega/\text{square}$, but fulfill less than $1,0 \times 10^{12} \Omega/\text{square}$.
- The material should be re-usable or recyclable and must in characteristics be designed such that no damage to the components can occur during handling, set-up, baking, testing, supply and assembly process.

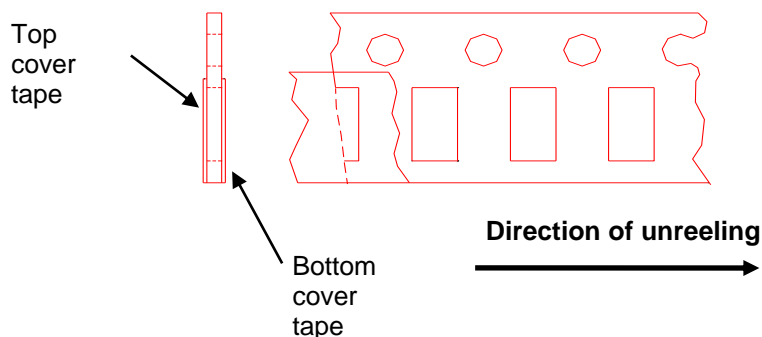
7.4 Bar magazine / Stick feeder

- Antistatic or conducting plastic (less than $10^{12} \Omega$)
- To be taped upon receiving, as this delivery form will not be handled on the SMT machines.

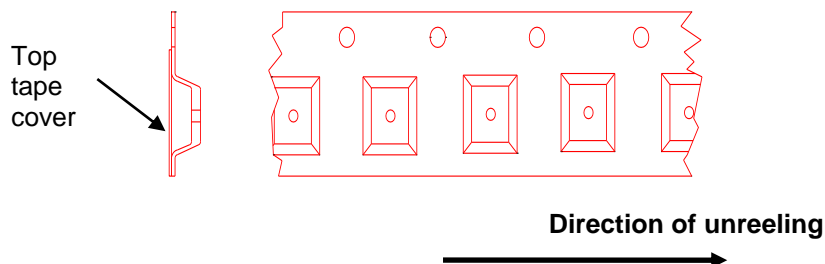
8 Packing types

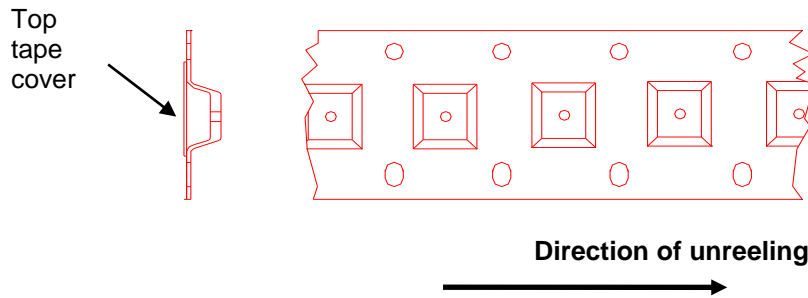
8.1 Paper and blister tape

Paper tape **Type I** (*punched tape*)



Blister tape **Type II** (*blister tape*)





8.1.1 Dimension

The nominal dimensions of the component compartments should be derived from the relevant component specifications. The tolerances of the nominal dimensions of the component compartments should be selected such that the component position is kept stable within the tape and with the following characteristics can be easily taken out from the tape / component compartment:

- The component does not extend over the surface of the carrier tape,
- The component can, after the top masking tape has been removed, be taken out of the component bag in vertical direction without mechanical restriction.
- The component may exhibit max. 10° height inclination and a max. planar rotation of 20° in the component compartment (see Illustration 1)
- The lateral movement of the component is limited to max. 0,5mm (see Illustration 1).

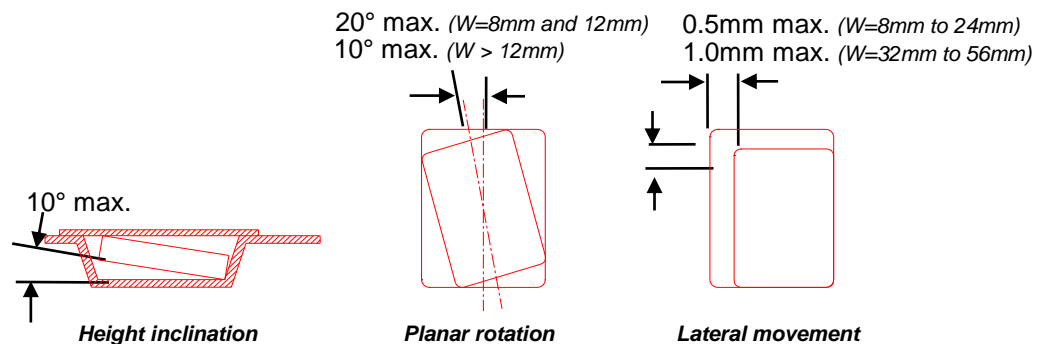


Illustration 1

- For component sizes of 2,0 mm X 1,2 mm and bigger, a hole should be present in the middle of the tape component compartment. The diameter of this hole should be min. 1 mm for tape widths of 8 mm, min. 1,5 mm for 12 mm to 24 mm and min. 2,0 mm for 32 mm to 56 mm tape widths.
- The distance between the component compartment centerpoints should be 2.0 mm or 4,0 mm or a multiple. The tolerance should be $\pm 0,1$ mm.

8.1.2 Polarity and alignment

- All polarized components must be oriented in one direction. For component with two terminations, the cathode side must be either adjacent to the sprocket hole or the last one to leave the package.
- For components in flat packages with more than two terminations, the termination #1 should be adjacent to the sprocket hole.
- For quartzes with two terminations legs on one side of the package, the terminations should be located at the sprocket hole side.
- The polarity or orientation of components with other forms or termination configuration should be determined via a detail specification.
- The mounting side of components must be oriented to the bottom side and is defined as the invisible side of the tape when reeled (see Illustration 2).

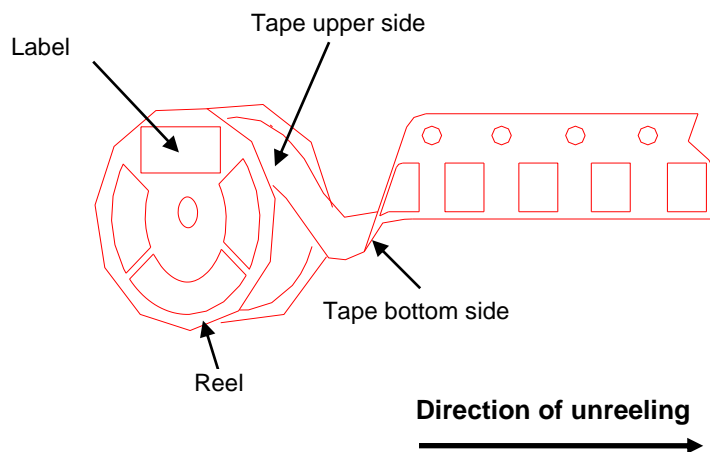


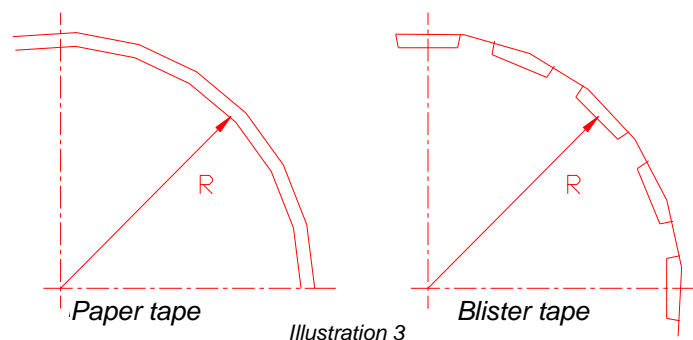
Illustration 2

8.1.3 Tape requirement

- No component should be missing between the first and last component on the reel.
- Max. 0.5% of the total number of components, acc. to IEC 286-3 and max. 2pcs in series may be missing between the first and last component on the reel.
- The components must be protected from falling out of the carrier tape. This should be secured with a masking tape that is to be welded onto the carrier tape.
- The masking tape should not extend over the edges of the carrier tape.
- The masking tape may not cover the transport perforation.
- The components may not stick to the masking tape or to the carrier tape.
- Reeled up carrier material may not stick together with the covering material.
- The packing, materials and processing techniques may not influence the mechanical and electrical properties as well as the inscription of the components.
- It is to be ensured that materials and processing techniques do not cause any damage to electrostatic-sensitive components.

- The welding process may not negatively influence or damage the carrier- nor masking tape.
- It is to be ensured that the transport perforation of the carrier tape is not extended, torn or damaged in any way.
- The material may not age or lose its strength so that it leads to breaking of the carrier tape or to detachment of the masking tape during the unwinding process. This applies both to manual or to machine unwinding.
- The masking tape may not become detached from the carrier tape and it must be ensured that the components remain unchanged in their position.
- The carrier tape must be specially designed for the handling of taped components, so that no changes of the electrical characteristics arise. Withdrawing humidity or chemical reactions may not affect the solderability or the function of the component negatively.
- The retention force at a peeling speed of 300mm/min \pm 10mm/min should keep to the following values:
 - **0.1N to 1.0N for a 8mm tape width**
 - **0.1N to 1.3N for 12 mm to 56 mm tape width**
 - **min. 0.1N at both edge sides**

(Measured at 165° - 180° and taking into consideration the component carrier along the longitudinal axis of the carrier tape)
- After the dehydrogenation at 60°C/48 hours or a storage of 6 months at a temperature of 18° - 26° and an air humidity of 35% - 65% the retention force may change by not more than $\pm 25\%$.
- The break force of the carrier tape in the direction of unreeling should be $\geq 10\text{N}$.
- If the tape material is bent with a minimum radius (see Table 1 and Illustration 3), the tape may not be damaged and the components must maintain their position and alignment.



Tape width [mm]	Min. Radius [mm]
8	25
12	30
16	30
24	30
32	50
44	50
56	75

Table 1 – minimum bending radius

- The curvature of the tape is not to exceed 1mm over a length of 250 mm (Illustration 4).

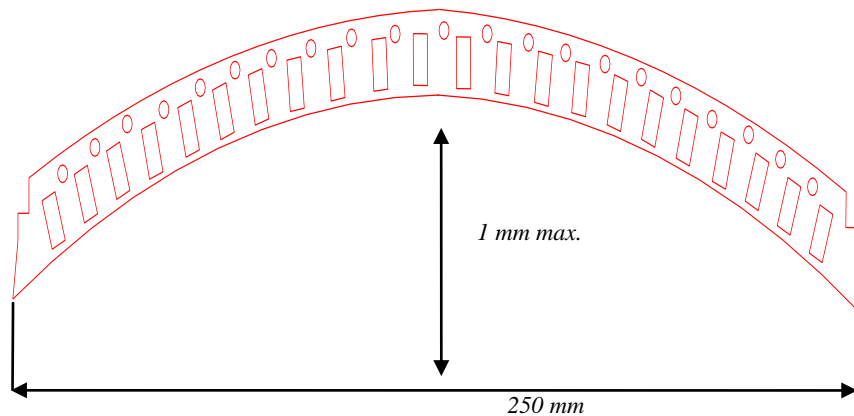


Illustration 4 – Curvature (Plan view)

- The length of the tape has to be at least 60 cm + approx. 10 cm empty tape + approx.. 40 cm masking tape.

8.1.4 Reel requirement

- Taped components up to 8 mm tape width must be delivered on reels with 7"ø or with 13"ø. All other components are to be delivered on reels 13"ø.
- The reel should have at the side a free space for an adhesive label (reel marking) (see Illustration 2).
- The manufacturer label for the reel marking should contain detailed information of the component in plain language according to Chapter 4.
- Further information can be indicated in plain language or in code form.

8.2 Tray

8.2.1 Dimension

The dimensions of the tray may not exceed 335 mm (length) and 230 mm (width).

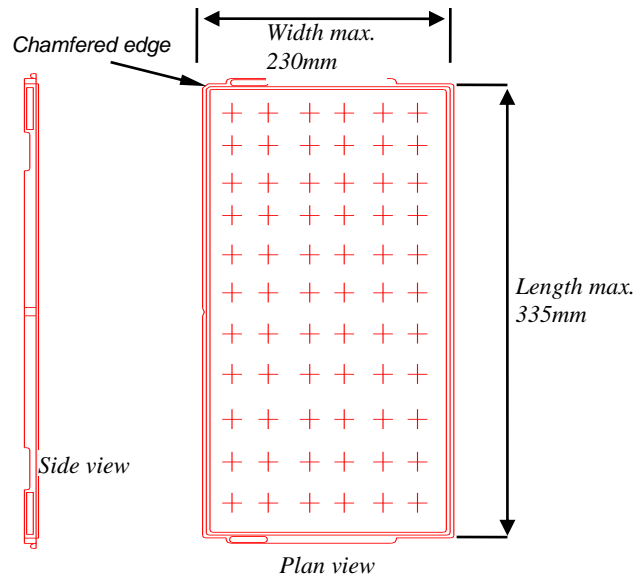


Illustration 5
Tolerances Matrix Tray

8.2.2 Component alignment

- The filling of the tray should begin at the top left corner, at the chamfered corner of the tray. From here, the columns are to be filled from left to right / from top to bottom.
- Pin1 of the component should face in the direction of the chamfered corner of the tray.

8.2.3 Tray stacking

- The topmost tray that contains components should be protected by an empty tray or a suitable equivalent cover.
- The components are not to extend over the top edge of the tray. The trays should be stackable one above the other, without damaging the components in the tray.
- The trays may not stick together during unstacking.

8.3 Bar magazine / Stick feeder

- Bar magazines / Stick Feeder must conform to IEC 60286-4: 1997.
- Bar magazines / Stick Feeder are not used in the SMT-Production.