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## 1 Scope

This instruction describes the packaging of Surface Mounted Devices (SMD), how to protect the products against damages during transport as well as quality lost due to electrical and environmental influences and personnel against hazards resulting from the goods themselves. Component packaging shall be designed in such a way that can be handled in Bosch production within process specification.

## 2 Terms

ESD: Electrostatic Discharge  
HIC: Humidity Indicator Card  
MBB: Moisture Barrier Bag  
MSD: Moisture Sensitive Devices  
MSL: Moisture Sensitivity Level  
PE: Polyethylene  
PET: High Density Polyethylene  
PP: Polypropylene  
PS: Polystyrene  
SMD: Surface Mounted Devices  
RH: Relative Humidity  
WVTR: The water vapor transmission rate

## 3 Moisture Sensitive Devices (MSD)

Moisture Sensitive Devices must be classified in accordance with the standards:

- J-STD-020
- IEC 61760-4 (for non-semiconductors)

Packaging and handling of MSD components must be in accordance with the standards:

- J-STD-033
- IEC 61760-4 (for non-semiconductors)

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## 4 Packaging

Important packaging characteristics:

- MSL
- Label (MAT-Label)
- Component Orientation
- Component Pick-up Height
- Tape Material
- Tape Pocket Pitch
- Tray Size (Length, Width, Height)
- Tray Pocket Pitch
- Tray Pocket Array Definition

ESD (Electro-Static Discharge) Protection:

All packaging and transport of packaging must fulfill international Norm:

- DIN | IEC 61340 / ANSI 20.20  
ESD protection; Means of transport and packaging in the EPA

Sticks/tubes are forbidden for component packaging.

Bulk supply of components is forbidden.

All components must be supplied in tape and reel packaging. Detailed mechanical drawings and/or descriptions of the tape and reel must be provided.

If tape and reel packaging is technically not feasible then trays may be used.

All tray packaging must be released by Bosch CoC SMT case by case – detailed mechanical drawings for the tray and drawings/description of the tray stack and its outer packaging must be provided.

### 4.1 Tape and Reel packaging

All types of tape & reel packaging and handling must be compliant with one of the following standards:

- IEC 60286-3
- EIA-481
- JIS C 0806

All materials used in tape & reel must be ESD safe and anti-static.

Tape and reel packaging must support baking at least 40°C ±5°C for a period up to 79 days without any mechanical alterations according to J-STD-033 norm except for MSL2 parts for which baking is not needed.

If specific requirements must be fulfilled for special components, the suitable standard/norm shall be applied.

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The components are placed on a plastic tape (carrier tape) with correspondingly shaped recesses in its surface, which is then sealed with a cover tape.

The reel must be made from polystyrene (PS).

The carrier tape according to the width will be made from the following materials:

- Paper tape: 8mm width
- Polystyrene (PS) tape: 8mm ~ 88mm width

The packaging shall be designed in such a way that will enable the insertion of parts and will not alter or damage the component form, fit or function during transport and handling.

Requirement of component cavities in packaging: component leads cannot touch cavity walls or cavity bottom (under normal storage and handling conditions).

The number of components per reel should be provided to Bosch. When there is more than one option of T&R sizes, Bosch will select the option with the biggest number of components per reel (as long as the dimensions are within specification).

- Tape Widths: 8; 12; 16; 24; 32; 44; 56; 72; 88; 104 mm.
- Reel Diameters: 7" / 180 mm; 13" / 330 mm; 15" / 380 mm.

Other reel diameters (17" / 430 mm; 19" / 480 mm; 22" / 560 mm) are possible in very restrictive conditions and may require special reel support for feeding to SMD placement machines.

An ESD plastic protection belt is required around the tape inside the reel to avoid damage to the tape and components in a vacuum-sealed package. (ref. Fig. 1 and Fig. 2).



Figure 1: Example of plastic ESD protection belt.

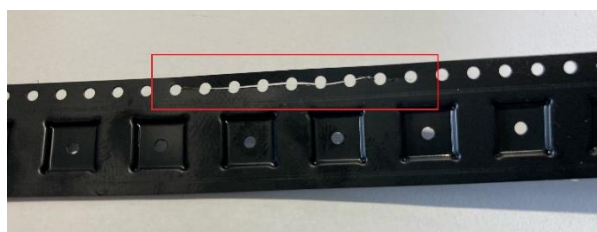


Figure 2: Damaged carrier tape caused by missing protection belt.

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The reels must be packed in an aluminum moisture barrier bag (MBB). ESD requirements need to be fulfilled for all MBB-packages and they need to wear the following sign (ref. Fig. 3):



Figure 3: Moisture sensitive devices and ESD sign.

The moisture barrier bag (MBB) must be vacuumed and not be damaged during the vacuuming process and must be securely closed until the time of arrival at the respective Bosch plant. Packages must have an “easy to open groove” which allows operators at Bosch production lines to open the bags without the necessity to use any tool. (ref. Fig. 4).



Figure 4: “V” cut shape for opening the MBB bag.

All MS-Level 2-4 parts need dry storage packages that must be equipped with a desiccant bag and a humidity indicator card (HIC). Desiccants shall not be placed directly over the tape to avoid damage to the tape and components in a vacuum-sealed package (ref. Fig. 5):

HIC shall not be placed in direct contact with desiccants (preferred on the other side of the reel) to avoid wrong reading of humidity in a vacuum-sealed package.



Figure 5: Example of desiccant placement inside MBB bag.

The exterior of the MBB bag must be labeled with a MAT-Label that reflects the component it contains.

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#### 4.1.1 Components for Hybrid products

All types of paper pocket and plastic pocket SMD components should follow IEC 60286-3 standard.

##### SMD component in paper pocket tape:

Only for SMD components resistor and capacitors 0402" the use of paper carrier tapes is allowed. In exceptional cases it is allowed to use the paper pocket for resistors and capacitors 0603". If possible pressed and or flamed pocket.

For doing that, the release of CoC placement Hybrid is necessary before.

##### SMD component in plastic tape:

Only allowed for components larger 0402"

##### Bare Dies in plastic pocket tape:

All types of Bare Dies in plastic pocket tape should follow EAI -763 standard.

Conditions to use plastic pocket tapes for Dies:

- Allowed for DIE > 0,8 mm edge length / DIE thickness >170 µm are must criteria.

No mix of different wafer lot numbers allowed on 1 reel.

All hybrid components must be packed using an ESD protective and sealed MBB bag. (ref. Fig. 6):



Figure 6: Example of ESD protective MBB bag.

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## 4.2 Tray Packaging

All tray packaging must be released by Bosch CoC SMT case by case. Detailed mechanical drawings for the tray and drawings/description of the tray stack and its outer packaging must be provided.

Packaging of components supplied in tray shall meet the requirements of at least one of the following standards (with regards to the individual tray):

- Active components supplied in tray packaging must adhere to the JEDEC standards (Design Guide 4-9 and/or Design Guide 4-10) for tray packaging.
- Non-active components supplied in soft trays (vacuum molded) must fulfill the following:
  - Bosch ESD requirements of the tray and any other element of the tray stack (stiffeners, binders, outer packaging, etc).
  - Tray dimension: L 85 × W 100 mm ~ L 230 × W 335 mm / Tray height: 2mm~30mm.
  - Tray material thickness ≥ 1.0 mm.
  - Tray warpage ≤ 0.5 mm.
  - Poka-Yoke position feature(s) on tray outline (cut corner, differentiated recesses, etc.).
  - Fitting features to safely stack multiple trays (components must not touch other trays, components must not be dislocated from their pockets, components must not be damaged).
  - Maximum component position error in the tray must not exceed 1.0 mm.
- If components are classified as moisture sensitive (MSL > 1, according to J-STD-020):
  - tray packaging of active components must support baking at least 125°C +10/-0°C for a period up to 96h – without any mechanical alterations according with J-STD-033 norm.
  - tray packaging of non-active components must support baking at least 40°C ±5°C for a period up to 79 days – without any mechanical alterations according with J-STD-033 norm.

Trays are arranged in a stack and stored in a bag which has the MAT-Label identifying the material in the stack.

Only one stack per bag is permitted. The bag may be an MBB as defined in J-STD-033.

Stack height should be limited to the maximum MBB sealing capability, and/or maximum MBB dimensions.

The top tray must be empty and serve as a cap for the tray immediately below housing components.

The stack must have stiffeners (plates of rigid material) placed on the top and bottom of the stack to prevent the damage of trays and components caused by the stack holding bands.

The stack is held together with at least two holding bands so the trays cannot move, and the components rest safely in the tray cavities.

The trays and the stack materials (stiffeners and bands) must be ESD-safe.

Mixing components/trays of different stacks (bags, MAT-label) is forbidden.

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### 4.3 Packing in cardboard boxes

The reel is supplied in a cardboard box (resembling a pizza box). (ref. Fig. 7)  
A MAT-Label according to the latest version of the labeling instruction must be placed on top of each package.



Figure 7: Example of packing the reels in MBB bag and “pizza box”.

Packages containing the reels are placed in a solid cardboard box of at least 5 mm thickness. (ref. Fig. 8).

The maximum load of a cardboard box is 15 kg. Free space of the cardboard box must be filled with appropriate packing material in a way that the packages can't shake or move in the box.



Figure 8: Packing in cardboard box.

Only one part number is allowed to be packed in one box, no mixing. Supplier-shipping-label must be placed on the short outside of the cardboard box.

Fully packed cardboard boxes need to be able to pass the described vibration and drop test in specification ISTA 3A 2018. Pass criteria: The MBBs must remain intact and vacuumed.



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#### 4.4 Not allowed packaging

- Bulk supply of components
- Reels:  
SMD components and Bare DIES packed in cardboard reels are not permitted to be delivered and used in Bosch AE. (ref. Fig. 9.a)
- Stick/tubes:  
SMD components and Bare DIES packed in stick/tube are not permitted to be delivered and used in Bosch AE. (ref. Fig. 9.b)



a)



b)

Figure 9: a) example of roller made from cardboard; b) components packed in tubes;

## 5 Labeling

Mandatory labeling for all plastic packaging.

Labeling according to DIN 6120 or ASTM D7611.

At least the following data must be printed on the exterior packaging label:

Material name

Serial number Bosch

Lot number

Date of manufacture & expiration date

Country of origin and manufacturer logo

Filling amount

Labeling according to the Bosch-AE Instruction MAT-Label in the currently applicable version applies:

<https://www.bosch.com/company/supply-chain/information-for-business-partners/#logistics-regulations-and-standards>

Further details are to be agreed with Bosch Coordinator for Material-Labels via:

[Release.MAT-Label@cn.bosch.com](mailto:Release.MAT-Label@cn.bosch.com)

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The exterior of the MBB bag must be labeled with a MAT-Label that reflects the component it contains. Every package and sub package must be labeled with the corresponding MAT-Label (ref. Fig. 10).


	Part No.: 5000000371	Date Code: 20151112
	Quantity 450 G	Exp.Date: 20161106
	Add Info: 5998691000#A#Q450#	
	Part Name: [REDACTED] A	Ord. Code: [REDACTED]
		MS-level N
		Index:
Supplier-ID	Package-ID	1-Batch No. 2-Batch No.
[REDACTED]	SDC1111111130	[REDACTED]
Purchase AE	[REDACTED] SAT	Shipping Note 8611215942
	Manufacturer Location	[REDACTED]
	Supplier-Name	[REDACTED] CORP.
	Supplier-Data	[REDACTED]
Man. Part No.	[REDACTED]	

Figure 10: Examples for MAT-Label

The Master/Single concept is needed when the label on the smallest package unit is not accessible at goods incoming. Therefore, the Single-Label must be attached on the smallest unit and the Master-Label on the outer package.

## 6 Outer packaging

All packaging shall be designed so that it fulfills the relevant requirements:

### 6.1 Protection against external physical impacts:

- Protection against damage through outer cardboard box and secure of the handling unit in the cardboard box.
- Outer box should be "wet-strength adhesive/water-resistant adhesive".
- Protection against corrosion and humidity in the second line through foil (PE or ESD) and vapor barrier.
- Only polypropylene (PP) or polyester (PET) straps are in general, permitted. The use of stretch or shrink foil shall be specially agreed on.

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## 6.2 Stackability of loading units

All pallet loads must be stackable and must withstand the transport conditions for different types of shipments: air, sea, road and rail. It is mandatory to use loading units with a dynamic stacking factor of at least = 2 (1+1), (ref. Fig. 11).



Figure 11: Dynamic stacking factor at least = 2 (1+1).

- Max. gross weight of 1000 kg per pallet (plant specific definition is possible)
- Max. gross weight up to 15 kg per manually handled loading unit (plant-specific definition is possible)

An outside cardboard pallet box with sufficient strength is needed during the transport to deliver the parts in a safe way and be able to stack the pallets avoiding damages. (ref. Fig. 12)



Figure 12: Cardboard pallet box example

## 6.3 Fill level

The fill level of the packaging must be optimized for a fully extended level.

- Unfilled level on a pallet is not allowed.
- In case shipping does not meet the level of a pallet, it must be extended with empty boxes or other filling materials.

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- Empty box needs to be placed in the middle of the pallet. (ref. Fig. 13).

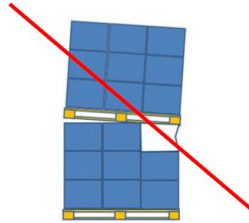


Figure 13: Wrong placement of empty box.

## 6.4 Specific requirements depending on transportation type

### 6.4.1 Land and air freight

Preferred external dimensions: L1200 x W800 x H1000 mm  
For air freight, the use of sea freight pallets is also permitted.

### 6.4.2 Sea freight

Due to long transportation distances and times, and changing requirements (climatic zones, mechanical stress, moisture, etc.), special attention must be given for ensuring suitable packaging for sea freight.

Loading units with dimensions optimized for the sea container must be used to reduce freight costs.

Preferred external dimensions for optimum utilization of shipping container loading volume are:

- L1175 x W750 x H460/750/1045 mm
- L1140 x W790 x H460/750/1045 mm
- L1140 x W980 x H460/750/1045 mm

Use of outer cardboards with moisture-proof / waterproof adhesive.  
The loading volume of the shipping container must be completely utilized.

## 6.5 Aspects to consider

- Easy to open and re-close
- Easy to repack
- Environmentally friendly
- Easy to dispose of
- Hygienic
- Without metal brackets or clips for employee safety reasons

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## 7 Modification history

Version	Date	Author	Change / Remarks
1.0	23.08.2019	Packaging CoC	First edition
1.1	25.01.2022	Packaging CoC	Implementation of minimum criteria for components for Hybrid production.