

The invention relates to a process according to the preamble of Claim 1 and to a device according to the preamble of Claim 6 for the strip mounting of SMT-capable semiconductor chips and an SMD board mounted thereby according to the preamble of Claim 8.

The technical problem consists in providing a suitably constructed semiconductor chip fit for automation for reprocessing and connecting to an SMD (Surface Mounted Device) board. For this purpose, it is proposed, for example in the case of semiconductor chips that are produced monolithically in the wafer matrix on a semiconductor substrate slice in a desired layer sequence, to provide their contact windows, which are surrounded by an insulating layer, with ribbon contacts, each ribbon contact being led from the respective contact window on the insulating layer up to the chip edge. Such semiconductor chips are SMT (surface mounting technology)-capable.

It is the object of the invention to specify a process and a device of the type mentioned at the beginning and an SMD board mounted thereby, in the case of which automated mounting of the semiconductor chips is enabled.

This object is achieved according to the invention by means of a process according to Claim 1, by means of a device according to Claim 6, and by means of an SMD board according to Claim 8.

Advantageous embodiments and developments of the invention are the subject of additional claims.

During the strip mounting, the SMT-capable semiconductor chips can be applied either with their backside or with their front side to a foil tape provided with an adhesive layer. For the purpose of transport, the foil tape has an appropriate perforation, or it is provided for stiffening purposes with an appropriate carrier tape which then has the transport perforation. The adhesive layer is applied selectively. A protective foil is intermediately wound between the foil tape or the stiffened foil tape in order to protect the semiconductor

chips.

The advantages achieved by means of the invention preferably consist in that the following are attained:

- Extreme packaging density.
- 5 - Elastic connection to the board via the conductive adhesive.
- Highest mounting performance.
- Problematical soldering process can be eliminated.
(This becomes ever more critical in the case of
- 10 smaller lead separation).
- Good heat dissipation from the semiconductor crystal onto the printed conductor or board, because of short paths from the junctions.

The invention is explained in more detail below
15 with reference to exemplary embodiments represented purely diagrammatically in the figures of the drawing, wherein

FIG. 1 shows a perspective view of a strip-mount packaging,

20 FIG. 2 shows a device for strip mounting, partly cut away, and

FIG. 3 shows a section through an SMD board.

Represented in FIG. 1 is a strip-mount packaging for the strip mounting of SMT-capable semiconductor chips
25 1. The semiconductor chips 1, which have ribbon contacts 2 (FIG. 3) led on their surface up to the chip edge, have already been applied separated in the wafer matrix to a self-adhesive foil 6 (FIG. 2). An adhesive layer 4 is applied selectively to the foil tape 3, which can be
30 taken up onto a reel 15. In this example, the foil tape 3 is applied to a carrier tape 5 provided with a transport perforation 7. The semiconductor chips 1 applied to the foil tape 3 are further expediently covered with a protective foil 8, which is constructed in this example
35 in the shape of a U. The semiconductor chips 1 are detached sequentially from the self-adhesive foil 6 (FIG. 2) and applied at defined separations to the foil tape 3 and bonded thereto. The device shown in FIG. 2 is particularly suitable for bonding the backsides of the

semiconductor chips 1 to the foil tape 3.

The SMT-capable semiconductor chips 1, which are applied already separated in the wafer matrix to a self-adhesive foil 6 that is jammed in two clamping rings 16, are applied to the foil tape 3 for strip mounting by means of the device represented in FIG. 2. The foil tape 3 is provided at prescribed locations with an adhesive layer 4 to which the semiconductor chips 1 are bonded. The separated semiconductor chips 1 located in the wafer matrix are brought at a slight separation of ≤ 0.2 mm over the foil tape guided on the X-Y cross table 10. The wafer matrix is aligned by means of an optoelectronic alignment device 11 with respect to the foil tape 3 guided on the X-Y cross table 10 in such a way that in each case the surface to be applied, i.e. in this example the backside of the semiconductor chip 1 is opposite a location of the foil tape 3 that is provided with the adhesive layer 4. Provided for the purpose of pushing the semiconductor chip 1 from the wafer matrix onto the respective location of the foil tape 3 that is provided with the adhesive layer 4 is a pusher 9 which is preferably constructed as an electromechanically operated push down pin.

This embodiment is particularly suitable for bringing the SMT-capable semiconductor chips 1 directly onto an SMD board with the aid of the described device. Such an SMD board is represented in FIG. 3. In order to apply the semiconductor chips 1 to the SMD board 12, the reel 15 (FIG. 1) is rotated by 180° and the foil tape 3 mounted with the semiconductor chips 1 is taken off such that the semiconductor chips once again point downwards with the active side, i.e. with the front side or with the side having the ribbon contacts 2. The SMD board 12 is provided on the connection pads 13 with a conductive adhesive 14, for example using a screen printing technique. The SMD board 12 located on an X-Y cross table 10 (FIG. 2), now moves into the so-called push-down position, and the semiconductor chip 1 is pressed with its ribbon contacts 2 onto the connection pads 13

provided with conductive adhesive 14, and accepted by adhesion. The adhesive connection is then stabilised by a suitable curing process.

5 Since the semiconductor chips 1 are to be applied with the front side to the foil tape 3, it is necessary once again to rebond the semiconductor chips 1, separated in the wafer matrix, on the self-adhesive foil 6 (FIG. 2). The semiconductor chips can then be applied to the foil tape 3 using the described process or the device.

10 In this embodiment of the strip mounting, the user can pick up the semiconductor chips 1 from the foil tape 3 using the so-called pick and place method known per se.



Patent claims

1. Process for the strip mounting of SMT-capable semiconductor chips, which have ribbon contacts led on their surface up to the chip edge and are applied already separated in the wafer matrix to a self-adhesive foil, characterised in that an adhesive layer (4) is applied selectively to a foil tape (3), and in that the semiconductor chips (1) are detached sequentially from the self-adhesive foil (6) and applied at defined separations to the foil tape (3) and bonded thereto.
2. Process according to Claim 1, characterised in that the foil tape (3) is provided with a transport perforation (7).
3. Process according to Claim 1, characterised in that the foil tape (3) is applied to a carrier tape (5) provided with a transport perforation (7).
4. Process according to one of Claims 1 to 3, characterised in that the semiconductor chips (1) applied to the foil tape (3) are covered with a protective foil (8).
5. Process according to one of Claims 1 to 4, characterised in that the foil tape (3) is provided at prescribed locations with an adhesive layer (4), in that the separated semiconductor chips (1) located in the wafer matrix on self-adhesive foil (6) are brought at a slight separation of ≤ 0.2 mm over the foil tape (3), in that the wafer matrix is aligned in such a way that in each case the surface of a semiconductor chip (1) to be connected is opposite a location of the foil tape (3) that is provided with the adhesive (4), and in that the semiconductor chip (1) is pushed by means of a pusher (9) from the wafer matrix onto the location of the foil tape (3) that is provided with the adhesive (4), and bonded to said tape.
6. Device for the strip mounting of SMT-capable semiconductor chips that have already been applied separately in the wafer matrix to a self-adhesive foil, characterised in that an adhesive layer (4) is applied at



prescribed locations to a foil tape (3), in that the separated semiconductor chip (1) located in the wafer matrix on self-adhesive foil (6) is brought at a slight separation of ≤ 0.2 mm over the foil tape (3) guided on an X-Y cross table (10), in that the wafer matrix is aligned by means of an optoelectronic alignment device (11) with respect to the foil tape (3) guided on the X-Y cross table (10) in such a way that the surface of a semiconductor chip (1) to be applied is opposite a location provided with the adhesive layer (4) and in that a pusher (9) is provided for the purpose of pushing the semiconductor chip (1) from the wafer matrix onto the location of the foil tape (3) that is provided with the adhesive layer (4).

7. Device according to Claim 6, characterised in that the pusher (9) is an electromechanically operated push down pin.

8. Process for mounting an SMD board with SMT-capable semiconductor chips, which are applied at defined separations to a foil tape and bonded thereto, characterised in that the board (12), which is provided with connection pads (13) and located on an X-Y cross table (9), is provided at prescribed locations on the connection pads (13) with a conductive adhesive (14), and in that the semiconductor chips (1) are pressed out of the foil tape (3) onto the connection pads (13) provided with conductive adhesive (14), and mounted on said connection pads.