

**SLIDING PROCESS FOR DETACHING A THIN  
ELECTRONIC DEVICE FROM AN ADHESIVE TAPE**

5    Field of the Invention

The invention relates to the detachment of an electronic device, such as a semiconductor die or chip, from an adhesive tape on which the electronic device has been mounted.

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Background and Prior Art

During a die bonding process, a semiconductor die is typically detached from an adhesive tape on which a wafer comprising a plurality of singulated semiconductor dice has been mounted. Each die is successively picked up  
15 by a die pick tool of a die bonder machine, and is then bonded onto a substrate by the die pick-up tool.

During the step of picking up the die, the die may be held by a collet of the die  
20 pick tool using a vacuum suction force generated at an opening of the collet. Prior to the die being lifted from the adhesive tape by the die pick tool, a die ejector may be used to push up against a bottom surface of the adhesive tape on which the die has been mounted to raise the die. Lifting the die aids in its delamination from the adhesive tape. The success of the delamination  
25 process to weaken adhesion between the die and the adhesive tape has an important bearing on the success of the die pick-up process.

With advances in technology, die thickness is constantly being reduced to meet the requirements of high-density electronic packages. Currently,  
30 semiconductor dice that are very small (such as having die sizes of less than 10mm) and thin (such as having thicknesses of 20-50 microns) are already being used in a variety of products. It has become ever more challenging to detach a semiconductor die from an adhesive film without damaging the die,

due to bending and other delamination forces that may cause die crack or die failure.

10 In the prior art, the main approaches for delaminating semiconductor dice  
5 make use of die ejector assemblies that comprise multiple pins or multiple  
plates. An example of a die ejector assembly that comprises multiple pins  
can be found in US patent number 6,386,815 entitled "Pick-up apparatus for  
semiconductor chips". Such a die ejector assembly has one or more ejector  
pins mounted on a pin holder having one or more stages.

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Multiple-pin ejector assemblies may cause damage to the die being  
delaminated because a local stress created at each contact area between the  
die and a sharp end of each pin can be quite high. The creation of pin marks  
resulting from such local stress should also be avoided. In particular, when a  
15 thickness of the die is smaller than say, 3 mils, a bending moment and strain  
that are induced on the die's surface will be correspondingly increased as the  
die becomes thinner.

On the other hand, an ejector assembly that comprises multiple plates has  
20 been described in US patent number 8,141,612 entitled "Device for Thin Die  
Detachment and Pick-Up". Instead of deploying pins, such a die ejector  
assembly has a plurality of movable plates that have quadrilateral-shaped  
contact surfaces which are arranged adjacent to one another. The contact  
surfaces of the movable plates together form a combined contact surface for  
25 supporting the adhesive film at the position of the die. Each movable plate is  
movable relative to the other movable plates away from the die so as to  
initiate delamination of the die at a position above the movable plate.

Although the risk of damage is reduced when using multiple movable plates  
30 as compared with the use of multiple pins, there are some disadvantages of  
using such ejector assemblies that comprise multiple plates. One  
shortcoming is that the thickness of each of the movable plates is limited by  
its material properties and processing capacity. For instance, when the die  
has a size that is smaller than 5mm, there is not enough space to include

several plates within a surface area of the die. Another reason is that if the plates are too thin, abrasion caused to the plates will affect the useful lifetime of plates. Finally, precise movement of the plates is not reliable due to a large relative frictional force that is present between adjacent movable plates.

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It would be beneficial to provide a method of detaching a semiconductor die that avoids at least some of the aforesaid shortcomings of the prior art.

### Summary of the Invention

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It is thus an object of the invention to seek to provide a method for effectively delaminating a small and thin die while substantially reducing the risk of damage while delaminating such a die.

15 Accordingly, the invention provides a method for detaching an electronic device from an adhesive tape on which the electronic device has been mounted, the method comprising the steps of: positioning the electronic device over an abutment protrusion mounted on an ejector assembly along a first axis, wherein the electronic device has a first edge and a second edge  
20 opposite to the first edge, and the abutment protrusion has a relatively fixed position on the ejector assembly along a second axis that is perpendicular to the first axis; moving the abutment protrusion along the first axis to push the abutment protrusion against the electronic device adjacent to the first edge of the electronic device, so as to lift the first edge of the electronic device away  
25 from the adhesive tape; sliding the electronic device and the ejector assembly relative to each other along the second axis while the electronic device is lifted by the abutment protrusion until the abutment protrusion is pushing against the electronic device adjacent to the second edge of the electronic device; contacting the electronic device with an electronic device holder, and  
30 removing the electronic device from the adhesive tape with the electronic device holder.

It would be convenient hereinafter to describe the invention in greater detail by reference to the accompanying drawings which illustrate specific preferred

embodiments of the invention. The particularity of the drawings and the related description is not to be understood as superseding the generality of the broad identification of the invention as defined by the claims.

## 5 Brief Description of the Drawings

An exemplary die detachment method in accordance with the invention will now be described with reference to the accompanying drawings, in which:

10 FIG. 1A is a plan view of a die ejector assembly including a abutment protrusion, and FIG. 1B is a plan view of the die ejector assembly located behind a matrix of semiconductor dice that are to be detached;

FIGs. 2A to 2C are side views of different embodiments of the abutment  
15 protrusion looking from direction A-A of FIG. 1A;

FIGs. 3A to 3C are side views of different embodiments of the abutment protrusion looking from direction B-B of FIG. 1A;

20 FIGs. 4A to 4I illustrate the steps involved in the delamination of a semiconductor die from an adhesive tape; and

FIG. 5 is a flowchart showing the steps involved in ensuring delamination of a die by adjusting a height of the abutment protrusion in case of failure to pick  
25 up a semiconductor die from the adhesive tape.

## Detailed Description of the Preferred Embodiment of the Invention

FIG. 1A is a plan view of an ejector assembly, such as a die ejector assembly  
30 10 including an abutment protrusion 12 that is centrally-located with respect to an ejector cap 20 of the ejector assembly. The abutment protrusion 12 generally has a linear profile comprising a narrow linear strip. The ejector cap 20 has a rectangular or elliptically-shaped opening 21 for the abutment protrusion 12 to emerge from inside a housing of the ejector cap 20. A size of

the opening 21 is designed according to a size of the abutment protrusion 12 and a size of an electronic device (such as a semiconductor die) being detached. The opening 21 is preferably small enough so that the risk of a die bending into the opening 21 is reduced or prevented, since excessive bending  
5 of the die might result in die crack. More preferably, the size of the opening 21 is smaller than the size of the die to prevent the die from being received into the opening 21.

Although the abutment protrusion 12 may project vertically to emerge from the  
10 opening 21, its horizontal position relative to the ejector cap 20 is fixed. This greatly simplifies the incorporation of the abutment protrusion 12 in the ejector cap 20. This is because additional space is not required within the ejector cap 20 to incorporate mechanisms for allowing horizontal movement of the abutment protrusion 12 relative to the die ejector cap 20 in the die ejector  
15 assembly 10, especially when very small dice are being detached and space inside the ejector cap 20 is at a premium.

FIG. 1B is a plan view of the die ejector assembly 10 located behind a matrix of semiconductor dice 15 that are to be detached from an adhesive tape 16  
20 on which the matrix of semiconductor dice 15 have been mounted. In particular, the abutment protrusion 12 is located below a first die 14 that is to be detached from the adhesive tape 16. The linear profile of the abutment protrusion 12 is arranged in use to extend parallel to a width of the first die 14 that is to be detached, and is dimensioned such that a span of the abutment  
25 protrusion 12 is slightly smaller than a width of the first die 14. The span of the linear profile of the abutment protrusion 12 may also be equal to the width of the first die 14. A narrower width of the linear strip of the abutment protrusion 12 is significantly smaller than the width of the first die 14 so that the abutment protrusion 12 is operative to apply a localized force to lift a  
30 portion of the first die 14 that the abutment protrusion 12 is pushing against.

FIGs. 2A to 2C are side views of different embodiments of the abutment protrusion 12 looking from direction A-A of FIG. 1A. The respective abutment protrusions 12 are shown to be mounted and arranged on a support 18, and

each abutment protrusion 12 has a specific shape at its top portion for contacting a target die. The dimensions of the top end of the abutment protrusion 12 may further be designed based on dimensions of the target die.

5 In FIG. 2A, the abutment protrusion 12a has a uniformly rectangular cross-section throughout. In FIG. 2B, the abutment protrusion 12b has a narrower tip, and it is tapered along its height so that its cross-sectional area gradually increases towards a base of the abutment protrusion 12b. The tip portion of the abutment protrusion 12b is thus narrower than the base of the abutment  
10 protrusion 12b. This design assists in improving the stability of the abutment protrusion 12b by introducing a wider base.

In FIG. 2C, the abutment protrusion 12c has a tip portion with a uniformly rectangular cross-section. Below the tip portion, the abutment protrusion 12c  
15 starts to widen and its cross-sectional area gradually increases towards a base of the abutment protrusion 12c. For a thinner target die, a width of the top end of the abutment protrusion of less than 300 microns may be needed. Accordingly, for thinner dice, the designs of FIG. 2B or FIG. 2C may be used for maintaining its tool strength notwithstanding the narrower width required at  
20 the tip portion.

FIGs. 3A to 3C are side views of different embodiments of the abutment protrusion 12 looking from direction B-B of FIG. 1A. Different shapes at the top of the abutment protrusion 12 can be selected for different device  
25 requirements.

In FIG. 3A, the abutment protrusion 12d generally has a generally rectangular profile from a side view so that its cross-sectional area is substantially rectangular, and it has a flat top surface. In FIG. 3B, the abutment protrusion  
30 12e has a curved convex top surface. Such a curved convex top surface pushing against a target die may help to apply a more localized force onto the target die to lift the same, if this is preferred for delaminating the target die.

In FIG. 3C, the abutment protrusion 12f also has a curved top surface, but its radius of curvature is smaller and its force localization effect is more pronounced than that of the abutment protrusion 12e shown in FIG. 3B. Whilst this design may be able to more effectively lift a target die when the  
5 abutment protrusion 12f, contacts the adhesive tape 16, more stress may be experienced by the target die. Thus, if the target die is, for instance, of a type that is more fragile and susceptible to cracking, this design would be less desirable in the interests of avoiding damage being caused to the target die.

10 The span, or longer side, of the abutment protrusion 12 should be equal to or slightly shorter than a length of a shorter edge of a target die. Furthermore, a width or shorter side of the abutment protrusion 12 may be in the range of 200 microns to 800 microns.

15 FIGs. 4A to 4I illustrate the steps involved in the delamination of a first die 14 from the adhesive tape 16 on which the first die 14 has been mounted. A side view of a die detachment apparatus is illustrated, wherein the abutment protrusion 12 is located within a housing of the ejector cap 20 which has an opening 21 from which the abutment protrusion 12 may protrude and project  
20 out from the opening of the ejector cap 20 along a first axis. In this arrangement, the first axis is vertical.

As shown in FIG. 4A, the support 18 is situated inside the housing of the ejector cap 20, and the abutment protrusion 12 which rises above the support  
25 18 is configured to be projectable from the opening 21 of the ejector cap 20 along the first axis by correspondingly raising the support 18. A vacuum suction force 22 is generated inside the ejector cap 20 (generally also in a direction along the first axis) through the opening 21 to retain the adhesive tape 16 on a top retaining surface of the ejector cap 20.

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The small size of the opening 21 ensures that the first die 14 is not received into the opening 21 when the adhesive tape 16 is retained on the top retaining surface of the ejector cap 20 by the vacuum suction force 22. As mentioned earlier, the abutment protrusion 12 is fixed relative to the ejector cap 20 at a

horizontal position along a second axis. Such horizontal second axis is perpendicular to the aforesaid vertical first axis.

5 The adhesive tape 16 on which the matrix of semiconductor dice 15 has been mounted is supported and stretched on an adhesive tape mounting frame 24. The adhesive tape mounting frame 24 may in turn be coupled to a positioning table (not shown) that is operable to move the adhesive tape mounting frame 24 (and therefore the adhesive tape 16 together with the first die 14) relative to the die ejector assembly 10, while the abutment protrusion 12 and the die  
10 ejector assembly 10 are stationary. Preferably, the positioning table is operable to position the adhesive tape mounting frame 24 along two orthogonal axes on a horizontal plane.

15 Alternatively, instead of the adhesive tape mounting frame 24 being coupled to a positioning table, the die ejector assembly 10 may be coupled to a driving system that is operable to move the die ejector assembly 10 (together with the abutment protrusion 12 and the ejector cap 20 at the same time) relative to the adhesive tape mounting frame 24. In this case, the entire die ejector assembly 10 would be moved relative to the adhesive tape mounting frame 24,  
20 without relative horizontal displacement required between the abutment protrusion 12 and the ejector cap 20.

Where the adhesive tape mounting frame 24 is coupled to a positioning table, the positioning table first moves the adhesive tape mounting frame 24 so that  
25 the first die 14 is located directly above the abutment protrusion 12. At the start of a die detachment process, the first die 14 is positioned vertically over the abutment protrusion 12 along the first axis. More specifically, the abutment protrusion 12 is positioned next to a first edge 14a of the first die 14 such that there is a starting offset 30 between a center of the abutment  
30 protrusion 12 and a left-most first edge 14a of the first die 14. The starting offset 30 may be optimized depending on the size and thickness of the first die 14. For example, for a die with a size of 3.5mm by 3.5mm by 25 microns, the starting offset 30 may be in the range of 200 microns to 500 microns. With a suitable starting offset, pre-peeling between the adhesive tape 16 and

the first die 14 will be induced to occur at a lower pre-peeling elevation height to reduce the risk of die crack and at the same time avoid excessive bending of an adjacent die.

5 As shown in FIG. 4B, at the position where there is a starting offset 30 between the abutment protrusion 12 and the first edge 14a of the first die 14, the abutment protrusion 12 is projected out from the ejector cap 20 and rises along the first axis to a pre-peeling elevation height 32 while the support 18 is being driven by an ejector motor or ejector cap motor. This raises the first die  
10 14 to an inclined position relative to the adhesive tape 16 such that the first edge 14a is lifted away from the adhesive tape 16. By doing so, pre-peeling commences between the first edge 14a of the first die 14 and the adhesive tape 16. The pre-peeling elevation height 32 is tailored differently for different die dimensions and different types of adhesive tape 16 having varying levels  
15 of adhesion force between the first die 14 and the adhesive tape 16. Whilst the support 18 located inside the ejector cap 20 is being driven to raise the abutment protrusion 12, it would be appreciated that alternatively, the entire die ejector assembly 10 may also be raised for pushing the abutment protrusion 12 against the first die 14.

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The abutment protrusion 12 waits for a certain time at the pre-peeling elevation height 32 for the adhesive tape 16 to successfully pre-peel from the edge of the first die 14. Thereafter, in FIG. 4C, the support 18 together with the abutment protrusion 12 are slightly lowered to a sliding elevation height 34.  
25 The lower sliding elevation height 34 after successful pre-peeling is preferable during sliding of the first die 14 relative to the abutment protrusion 12 as it helps to reduce the risk of die crack and the die flying off if the first die 14 unexpectedly detaches from the adhesive tape 16 prematurely. A lower sliding elevation height 34 also increases the die peeling efficiency and  
30 reduces undue or excessive bending that may be caused to an adjacent die.

With the abutment protrusion 12 being projected at the said sliding elevation height 34, the positioning table moves the adhesive tape mounting frame 24 together with the first die 14 relative to the ejector cap 20 along the second

axis in a horizontal direction 36 so that the first die 14 is slid across the position of the abutment protrusion 12 along the width of the first die 14, as illustrated in FIG. 4D. The sliding process may be achieved either by the motion of the adhesive tape mounting frame 24 and/or by the die ejector assembly 10 without the need for any relative horizontal movement between the abutment protrusion 12 and the ejector cap 20. Such sliding motion promotes further peeling between the adhesive tape 16 and the first die 14 at various positions where the tip of the abutment protrusion 12 has pushed the first die 14 upwards.

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Such sliding motion continues until the abutment protrusion 12 is located adjacent to a second edge 14b of the first die 14 which is opposite to the first edge 14a, whereat an ending offset 38 is attained between the center of the abutment protrusion 12 and the second edge 14b of the first die 14, as shown in FIG. 4E. At this position, the abutment protrusion 12 is pushing against the first die 14 adjacent to the second edge 14b of the first die 14 without the first die 14 being completely peeled off from the adhesive tape 16 at this time. A suitable value for the ending offset 38 is selected to avoid the first die 14 being peeled off completely at this time, which may result in the first die 14 flying off or a position of the first die 14 being shifted such that its placement position is changed during die pick-up. This also reduces bending caused to an adjacent die.

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At this position of the first die 14 where the ending offset 38 has been reached, an electronic device holder, which may be in the form of a collet 50 of a bond head of a die bonder, may then be lowered towards the first die 14. The abutment protrusion 12 is positioned at the said ending offset 38 during contact between the collet 50 and the first die 14. The collet 50 provides a vacuum suction force for holding the first die 14. It would be noted that FIG. 4F depicts that the collet 50 contacts the first die 14 with a collet offset 42 present between a center of the collet 50 and a center of the abutment protrusion 12. Therefore, the collet 50 and the abutment protrusion 12 are not aligned along the first axis at this time, which enhances operational control

over the position of the first die 14 and avoids premature detachment or unwanted shifting of the first die 14 from the adhesive tape 16.

5 Prior to contacting the first die 14, the collet 50 is first stopped at a bond head search height 40, before the collet 50 is further lowered gradually to a die pick-up level at a setting speed until the collet 50 fully contacts the first die 14 at the position of the collet offset 42, as illustrated in FIG. 4G.

10 After the collet 50 has been lowered to the die pick-up level, the collet 50 waits for a short time period until the second edge 14b of first die 14 is peeled completely from the adhesive tape 16, then the abutment protrusion 12 may be moved a standby level where the abutment protrusion 12 is flush with or below a top retaining surface of the ejector cap 20. This should further help to avoid the risk of the first die 14 flying off by ensuring a controlled separation  
15 distance between the first die 14 and the collet 50, prior to removing a biasing force exerted by the abutment protrusion 12 against the first die 14.

After the collet 50 comes into contact with the first die 14, vacuum suction in the collet 50 is activated so as to secure the first die 14 onto a vacuum suction  
20 opening in the collet 50. Thereafter, the collet 50 lifts the delaminated first die 14 from the adhesive tape 16, as shown in FIG. 4H, and moves the first die 14 to a bonding location for bonding the first die 14.

After the first die 14 has been successfully picked up from the adhesive tape  
25 16, the positioning table moves the adhesive tape mounting frame 24 until a second die 52 to be picked up is located over the abutment protrusion 12. A new die pick-up process for the second die 52 similar to the pick-up process described above is then conducted.

30 FIG. 5 is a flowchart showing the steps involved in ensuring delamination of a target die by adjusting a height of the abutment protrusion 12 in case of failure to pick up a target die from the adhesive tape 16. Generally, although a lower pre-peeling elevation height 32 can reduce the risk of die crack, different target dice at respective areas of a wafer may have different degrees of

adhesion to the adhesive tape 16. When encountering a missing die error when the collet 50 fails to remove and pick up a target die, the die bonding apparatus should automatically check whether the target die still remains on the adhesive tape 16. If so, the die bonding apparatus can repeat the pick-up  
5 sequence using an adjusted pre-peeling elevation height 32.

Referring to FIG. 5, at step 60, the system determines that a target die is missing from the collet 50, indicating that the collet 50 has not successfully picked up a target die. At step 62, a position of the target die on the adhesive  
10 tape 16 is inspected to check whether the target die has remained on the adhesive tape 16. At step 64, if the target die is no longer on the adhesive tape 16, then it is not necessary to attempt to pick up the target die again, and an operator may be prompted that there has been a process error. If the target die remains on the adhesive tape 16, at step 66, the abutment  
15 protrusion 12 is raised to increase the pre-peeling elevation height 32.

At step 68, another attempt is thereafter made to pick up the target die. At step 70, if the target die is again not successfully picked up, then step 62 is repeated so as to inspect the adhesive tape 16 to check whether the target  
20 die has remained on the adhesive tape 16. If there is no missing die this time and the target die has been successfully picked, the abutment protrusion 12 is lowered at step 72 to decrease the pre-peeling elevation height 32. The system is then ready to pick up another die next to the target die (step 74) that is moved to the position above the abutment protrusion 12.

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For instance, in the aforesaid process, if a die pick-up has failed when the pre-peeling elevation height 32 is set at 300 microns, the pre-peeling elevation height 32 may be increased to 350 microns for repeating the pre-peeling activation. The adjustment steps and number of repetitions can be set  
30 by an operator to ensure successful automatic pick-up of each target die.

It should be appreciated that the invention according to the preferred embodiment described above provides a method for detaching very thin semiconductor dice 14, 52 from an adhesive film 16. It is especially beneficial

for handling ultra-small thin semiconductor dice that are thinner than 2mils, and smaller than 5mm by 5mm.

5 A smaller opening 21 on the ejector cap 20 enabled by the preferred embodiment can reduce the likelihood of the die bending into the opening 21, which might result in die crack. Further, since the collet 50 picks up a target die at a position that is offset from a center of the ejector cap 20, this helps to reduce the risk of a target die flying off, as well as optimizes efficiency and productivity. The risk of a die flying off is further controlled with an optimized  
10 process sequence for relative movement between the collet 50 and the die ejector assembly 10.

During a pick-up sequence, detection of a missing die would lead to an automatic adjustment algorithm being implemented to vary a pre-peeling  
15 elevation height 32 of the abutment protrusion 12, thereby increasing a die detachment success rate. When there is a failure to pick up a target die, another attempt is automatically made with a different pre-peeling elevation height 32 in order to successfully pick up the target die.

20 The invention described herein is susceptible to variations, modifications and/or additions other than those specifically described and it is to be understood that the invention includes all such variations, modifications and/or additions which fall within the spirit and scope of the above description.

CLAIMS:

1. Method for detaching an electronic device from an adhesive tape on which the electronic device has been mounted, the method comprising the  
5 steps of:

positioning the electronic device over an abutment protrusion mounted on an ejector assembly along a first axis, wherein the electronic device has a first edge and a second edge opposite to the first edge, and the abutment protrusion has a relatively fixed position on the ejector assembly along a  
10 second axis that is perpendicular to the first axis;

moving the abutment protrusion along the first axis to push the abutment protrusion against the electronic device adjacent to the first edge of the electronic device, so as to lift the first edge of the electronic device away from the adhesive tape;

15 sliding the electronic device and the ejector assembly relative to each other along the second axis while the electronic device is lifted by the abutment protrusion until the abutment protrusion is pushing against the electronic device adjacent to the second edge of the electronic device;

contacting the electronic device with an electronic device holder, and  
20 removing the electronic device from the adhesive tape with the electronic device holder.

2. Method as claimed in claim 1, wherein the ejector assembly includes an ejector cap and an opening on a surface of the ejector cap from which the  
25 abutment protrusion is projectable from inside a housing of the ejector cap along the first axis.

3. Method as claimed in claim 2, further including the step of generating a vacuum suction force from inside the ejector cap through the opening for  
30 retaining the adhesive tape on a top retaining surface of the ejector cap.

4. Method as claimed in claim 3, wherein a size of the opening is smaller than a size of the electronic device to prevent an electronic device being

received into the opening when the adhesive tape is retained on the top retaining surface by the vacuum suction force.

5. Method as claimed in claim 1, wherein the adhesive tape is supported  
5 and stretched on an adhesive tape mounting frame, and the adhesive tape mounting frame is in turn coupled to a positioning table, such that during the step of sliding the electronic device and the ejector assembly relative to each other, the positioning table moves the adhesive tape relative to the ejector assembly while the abutment protrusion and the ejector assembly are  
10 stationary.

6. Method as claimed in claim 1, wherein the ejector assembly is coupled to a driving system for moving the ejector assembly including the abutment protrusion together relative to the adhesive tape.

15 7. Method as claimed in claim 1, further comprising the step of actuating the abutment protrusion to push against the electronic device adjacent to the first edge at a starting offset between the first edge of the electronic device and the abutment protrusion, such starting offset being operative to initiate  
20 pre-peeling between the first edge of the electronic device and the adhesive tape.

8. Method as claimed in claim 7, wherein the abutment protrusion is raised to a pre-peeling elevation height which inclines the electronic device  
25 relative to the adhesive tape to initiate pre-peeling without an excessive bending of a second electronic adjacent to the electronic device, so as to avoid causing damage to the second electronic device.

9. Method as claimed in claim 8, wherein the abutment protrusion is  
30 lowered from the pre-peeling elevation height to a sliding elevation height prior to sliding the electronic device and the ejector assembly relative to each other, the abutment protrusion being maintained at the sliding elevation height during such sliding motion.

35 10. Method as claimed in claim 1, wherein when the abutment protrusion is pushing against the electronic device adjacent to the second edge, the

abutment protrusion is located at an ending offset between the abutment protrusion and the second edge, such that the electronic device is not completely peeled off from the adhesive tape at the end of the sliding motion.

5     11. Method as claimed in claim 10, further comprising the step of lowering the abutment protrusion away from the electronic device after the electronic device is contacted by the electronic device holder and the adhesive tape is peeled from the second edge of the electronic device, prior to the electronic device holder removing the electronic device from the adhesive tape.

10     12. Method as claimed in claim 1, wherein the electronic device holder contacts the electronic device at an electronic device holder offset between a center of the electronic device holder and a center of the abutment protrusion, such that the electronic device holder and the abutment protrusion are not  
15 aligned along the first axis.

13. Method as claimed in claim 1, further comprising the step of detecting whether the electronic device holder has failed to remove an electronic device from the adhesive tape, and if the electronic device remains on the adhesive  
20 tape, increasing the pre-peeling elevation height before sliding the electronic device and the ejector assembly relative to each other during a subsequent repeated attempt to detach the electronic device from the adhesive tape.

14. Method as claimed in claim 1, wherein the abutment protrusion  
25 comprises a narrow linear strip that is arranged in use to extend parallel to a width of the electronic device which is being detached.

15. Method as claimed in claim 14, wherein a span of the linear strip is equal to or slightly smaller than the width of the electronic device.

30     16. Method as claimed in claim 14, wherein a width of the linear strip is significantly small than a width of the electronic device to apply a localized force to lift a portion of the electronic device the linear strip is pushing against.

17. Method as claimed in claim 1, wherein the abutment protrusion has a tapered profile along the first axis such that a tip portion of the abutment protrusion is narrower than a base of the abutment protrusion.
- 5 18. Method as claimed in claim 1, wherein a tip of the abutment protrusion has a convex surface for pushing against the electronic device.
19. Method as claimed in claim 1, wherein a cross-section of the abutment protrusion along a width of the abutment protrusion is substantially
- 10 rectangular.