

(12)

Description

Background of the Invention

The present invention relates to the field of lead frames and methods of handling bonding pads. More particularly, the present invention relates to lead frames and methods of especial utility in the handling of a plurality of electronic parts of small physical dimensions.

In the manufacture of miniature electronic devices, it is common practice to individually bond a plurality of circuit die elements or other devices to respective bonding pads attached to strip like lead frames. Lead frames of this type facilitate the pick and place positioning and bonding of the individual circuit elements to the bonding pad during this operation. Ultimately, these individual circuit elements with the bonding pad must be separated from the lead frame by removal of the tag securing them to the frame. Generally this must be done prior to testing, lead bending, marking or other subsequent operations.

However, these parts are inherently difficult to handle individually due to their small size, and overall, the physical dimensions of such circuit elements are continually decreasing as technology progresses. Moreover, upon removal from the lead frame, the proper orientation of each element becomes lost and they must be re-oriented with the expenditure of even greater operator time and effort.

To solve the problem of individually retaining the circuit elements upon removal of the tag securing them to the lead frame, there has previously been proposed the conjunctive use of a paper or plastic tape having individual pockets to retain the removed elements. This tape, advanced 90 degrees to the longitudinal axis of the lead frame, allows the individual elements to drop in a random orientation into a retaining pocket upon its removal from the lead frame. However, this method is expensive to implement in terms of both tape and related equipment, does not retain a uniform orientation of the part and adds an additional handling step prior to performing tests, marking or lead bending operations.

US-A-3,426,423 discloses a method of manufacturing semiconductor devices in which the leads of a device to be produced are maintained in a fixed spaced relationship during construction of the device, by means of an adhesive tape strip. This method does not however involve the use of a lead frame nor does it solve the problem of handling such devices after severance from such a frame.

It is therefore an object of the present invention to provide an improved lead frame and method of handling bonding pads.

It is further an object of the present invention to provide an improved lead frame and method of handling bonding pads which is inexpensive to implement using readily available materials.

It is still further an object of the present invention to provide an improved lead frame and

method of handling bonding pads in which the orientation and position of the individual elements is maintained.

It is still further an object of the present invention to provide an improved lead frame and method of handling bonding pads which does not require an additional handling step.

It is still further an object of the present invention to provide an improved lead frame and method of handling bonding pads which allows the individual elements to be handled as a unit through test, marking and lead bending operations.

Summary of the Invention

The foregoing objects are achieved in the lead frame of the present invention which comprises at least one runner presenting parallel opposite upper and lower faces thereof,

a plurality of bonding pads connected to said runner and spaced laterally from said runner such that the connections between said bonding pads and runner can be severed, said bonding pads presenting opposite upper and lower surfaces thereof, and

a tape strip adhesively and removably secured to said runner lower face and bonding pad lower surfaces.

The circuit elements may then be handled as a unit by means of the lead frame/tape strip combination in subsequent testing, marking, lead bending or other handling operations.

Brief Description of the Drawings

The abovementioned and other features and objects of the invention and the manner of attaining them will become more apparent and the invention itself will be best understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a top plan view of a portion of a lead frame according to the present invention showing the lead frame and individual bonding pads in conjunction with an adhesive tape strip both before and after removal of the tags retaining the circuit elements to the lead frame; and

FIG. 2 is a side plan view of the lead frame of FIG. 1 having a portion of one runner cut away to illustrate the adherence of the lead frame and bonding pad to the adhesive tape strip.

Description of a Preferred Embodiment

Referring now to FIGS. 1 and 2, an improved lead frame 10 according to the present invention is shown. Improved lead frame 10 comprises in major part a conventional lead frame 12 in conjunction with an adhesive tape strip 14.

In the embodiment illustrated, lead frame 12 comprises a pair of parallel and spaced apart runners 42 interconnected by means of tie bars 16, and bonding pads 18 as removably affixed to tags 20. A plurality of perforations 22 communicate between upper face 24 and lower face 26 of lead frame 12. Perforations 22, allow for the

indexing and accurate positioning of lead frame 12 through die bonding and other handling operations. Tie bars 16 maintain the structural integrity of lead frame 12 both before and after removal of tags 20 attached to bonding pads 18.

As shown, bonding pads 18 present an upper surface 28 and opposite lower surface 30. In general, a die 32 is bonded to upper surface 28 of one of bonding pads 18 during a die bonding operation. Together, die 32 and one of bonding pads 18 comprise an individual circuit element. Although not illustrated, bonding pads 18 may additionally comprise a number of leads to the individual circuit elements in the die for use in a subsequent wire bonding operation.

Bonding pads 18 are removable from lead frame 12 by the severance of tags 20 at detachment points 44. Thus, interstitial spaces 34 and 36 separating bonding pad 18 from lead frame 12 become conterminous upon the severance of tags 20. In a conventional operation, an individual die 32 as bonded to one of bonding pads 18 is then physically and individually removed from lead frame 12.

In the present invention, an adhesive tape strip 14 having an adhesive surface 38 and an opposite surface 40 is rolled or pressed onto lead frame 12 such that adhesive surface 38 contacts lower face 26 and lower surface 30. In general, adhesive tape strip 14 could be applied after the die bonding step. In this manner, adhesive tape strip 14 is adhesively secured to lead frame 12 and bonding pads 18 both before and after severance of tags 20 at detachment points 44. Thus, the position and orientation of the individual components comprising die 32 and its associated one of bonding pads 18 is maintained. It should be noted that tie bars 16 provide structural integrity to lead frame 12 such that the combination of lead frame 12, adhesive tape strip 14 and severed bonding pads 18 may be handled as a unit through subsequent test, lead bending, marking or other handling operations.

In the embodiment above described, adhesive tape strip 14 may be conveniently furnished as standard eight millimeter mylar tape. However, any other adhesive tape comprising a non-conductive material may be utilized as well, as the small amount of adhesive remaining on lower surface 30 of bonding pads 18 after removal from adhesive tape strip 14 will not affect subsequent circuit element attachment.

What has been provided therefore is an improved lead frame and method which is inexpensive to implement and uses readily available materials. Further, the improved lead frame and method of the present invention maintains the orientation and position of the individual elements while not requiring any additional handling step. Moreover, the improved lead frame and method of the present invention allows the individual elements to be handled as a unit through test, marking, lead bending and other handling operations.

While there has been described above the invention in conjunction with specific apparatus, it

is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of the invention. Particularly, other lead frame structures may be utilized in conjunction with an adhesive strip according to the present invention which utilize only a single runner, and/or different bonding pad, tie bar or tag element configurations.

Claims

1. A lead frame (12) comprising:

at least one runner (42) presenting parallel opposite upper and lower faces thereof,

a plurality of bonding pads (18) connected to said runner and spaced laterally from said runner such that the connections between said bonding pads and said runner can be severed, said bonding pads presenting opposite upper (28) and lower (30) surfaces thereof, and

a tape strip (14) adhesively and removably secured to said runner lower face and bonding pad lower surfaces.

2. The lead frame of claim 1 wherein said lead frame further comprises a die (32) bonded to said bonding pad upper surfaces.

3. The lead frame of claim 1 or 2 comprising:

first and second parallel and spaced-apart runners (42) having a plurality of generally perpendicularly disposed tie bars (16) therebetween, said tie bars being in a generally parallel and spaced apart relationship and said runners presenting parallel opposite upper and lower faces thereof,

said plurality of bonding pads (18) connected to said runners, disposed interstitially between said tie bars, and spaced from the said runners such that the connections between said bonding pads and said runners can be severed, and

the tape strip (14) extending longitudinally between said runners and adhesively and removably secured to said runner lower faces and said bonding pad lower surfaces,

whereby said bonding pads may remain adhesively and removably secured to said tape strip after detachment from said runners.

4. A method for handling a plurality of bonding pads comprising the steps of:

providing a lead frame (12) having at least one runner (42) presenting parallel opposite upper and lower surfaces thereof, said lead frame having a plurality of bonding pads (18) connected to said runner and spaced laterally from said runner such that the connections between said bonding pads and said runner can be severed, said bonding pads presenting opposite upper (28) and lower (30) surfaces thereof,

adhesively and removably securing a tape strip (14) to said runner lower face and said bonding pad lower surfaces, and

severing said connections between said bonding pads and said runner,

whereby said bonding pads may remain adhesively and removably secured to said tape strip after said connections have been severed.

indexing and accurate positioning of lead frame 12 through die bonding and other handling operations. Tie bars 16 maintain the structural integrity of lead frame 12 both before and after removal of tags 20 attached to bonding pads 18.

As shown, bonding pads 18 present an upper surface 28 and opposite lower surface 30. In general, a die 32 is bonded to upper surface 28 of one of bonding pads 18 during a die bonding operation. Together, die 32 and one of bonding pads 18 comprise an individual circuit element. Although not illustrated, bonding pads 18 may additionally comprise a number of leads to the individual circuit elements in the die for use in a subsequent wire bonding operation.

Bonding pads 18 are removable from lead frame 12 by the severance of tags 20 at detachment points 44. Thus, interstitial spaces 34 and 36 separating bonding pad 18 from lead frame 12 become continuous upon the severance of tags 20. In a conventional operation, an individual die 32 as bonded to one of bonding pads 18 is then physically and individually removed from lead frame 12.

In the present invention, an adhesive tape strip 14 having an adhesive surface 38 and an opposite surface 40 is rolled or pressed onto lead frame 12 such that adhesive surface 38 contacts lower face 26 and lower surface 30. In general, adhesive tape strip 14 could be applied after the die bonding step. In this manner, adhesive tape strip 14 is adhesively secured to lead frame 12 and bonding pads 18 both before and after severance of tags 20 at detachment points 44. Thus, the position and orientation of the individual components comprising die 32 and its associated one of bonding pads 18 is maintained. It should be noted that tie bars 16 provide structural integrity to lead frame 12 such that the combination of lead frame 12, adhesive tape strip 14 and severed bonding pads 18 may be handled as a unit through subsequent test, lead bending, marking or other handling operations.

In the embodiment above described, adhesive tape strip 14 may be conveniently furnished as standard eight millimeter mylar tape. However, any other adhesive tape comprising a non-conductive material may be utilized as well, as the small amount of adhesive remaining on lower surface 30 of bonding pads 18 after removal from adhesive tape strip 14 will not affect subsequent circuit element attachment.

What has been provided therefore is an improved lead frame and method which is inexpensive to implement and uses readily available materials. Further, the improved lead frame and method of the present invention maintains the orientation and position of the individual elements while not requiring any additional handling step. Moreover, the improved lead frame and method of the present invention allows the individual elements to be handled as a unit through test, marking, lead bending and other handling operations.

While there has been described above the invention in conjunction with specific apparatus, it

is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of the invention. Particularly, other lead frame structures may be utilized in conjunction with an adhesive strip according to the present invention which utilize only a single runner, and/or different bonding pad, tie bar or tag element configurations.

Claims

1. A lead frame (12) comprising:

at least one runner (42) presenting parallel opposite upper and lower faces thereof,

a plurality of bonding pads (18) connected to said runner and spaced laterally from said runner such that the connections between said bonding pads and said runner can be severed, said bonding pads presenting opposite upper (28) and lower (30) surfaces thereof, and

a tape strip (14) adhesively and removably secured to said runner lower face and bonding pad lower surfaces.

2. The lead frame of claim 1 wherein said lead frame further comprises a die (32) bonded to said bonding pad upper surfaces.

3. The lead frame of claim 1 or 2 comprising:

first and second parallel and spaced-apart runners (42) having a plurality of generally perpendicularly disposed tie bars (16) therebetween, said tie bars being in a generally parallel and spaced apart relationship and said runners presenting parallel opposite upper and lower faces thereof,

said plurality of bonding pads (18) connected to said runners, disposed interstitially between said tie bars, and spaced from the said runners such that the connections between said bonding pads and said runners can be severed, and

the tape strip (14) extending longitudinally between said runners and adhesively and removably secured to said runner lower faces and said bonding pad lower surfaces,

whereby said bonding pads may remain adhesively and removably secured to said tape strip after detachment from said runners.

4. A method for handling a plurality of bonding pads comprising the steps of:

providing a lead frame (12) having at least one runner (42) presenting parallel opposite upper and lower surfaces thereof, said lead frame having a plurality of bonding pads (18) connected to said runner and spaced laterally from said runner such that the connections between said bonding pads and said runner can be severed, said bonding pads presenting opposite upper (28) and lower (30) surfaces thereof,

adhesively and removably securing a tape strip (14) to said runner lower face and said bonding pad lower surfaces, and

severing said connections between said bonding pads and said runner,

whereby said bonding pads may remain adhesively and removably secured to said tape strip after said connections have been severed.



5. The method of claim 4 wherein said step of adhesively and removably securing said tape strip is carried out by means of an adhesive tape.

6. The method of claims 4 or 5 comprising the steps of:

providing the lead frame (12) having first and second parallel and spaced-apart runners (42), with a plurality of generally perpendicularly disposed tie bars (16) therebetween in a generally parallel and spaced apart relationship, said runners presenting parallel opposite upper and lower faces thereof, said lead frame having said plurality of bonding pads (18) disposed between said tie bars, connected to said runners and spaced therefrom such that the connections between said bonding pads and said runners can be severed, and

longitudinally extending a tape strip (14) along said lead frame, said tape strip being adhesively and removably secured to said runner lower faces and said bonding pad lower surfaces,

whereby said bonding pads may remain adhesively and removably secured to said tape strip after detachment from said runners.

Patentansprüche

1. Leiterraum (12) enthaltend:

wenigstens ein Längsband (42), das parallele, einander gegenüberliegende Ober- und Unterseiten aufweist,

mehrere Befestigungsflecken (18), die mit dem Längsband verbunden sind und einen Querabstand zu dem Längsband haben derart, daß die Verbindungen zwischen den Anschlußflecken und dem Längsband aufgetrennt werden können, wobei die Anschlußflecken einander gegenüberliegende Ober- und Unterseiten (28, 30) aufweisen, und

einen Bandstreifen (14), der lösbar an der Unterseite des Längsbandes und den Unterseiten der Befestigungsflecken festgeklebt ist.

2. Leiterraum nach Anspruch 1, bei dem der Leiterraum weiterhin einen Stempel (32) aufweist, der an den Oberseiten der Befestigungsflecken befestigt ist.

3. Leiterraum nach Anspruch 1 oder 2, enthaltend:

erste und zweite parallel und im Abstand zueinander angeordnete Längsbänder (42) mit einer Mehrzahl von im wesentlichen senkrecht angeordneten Verbindungsstäben (16) dazwischen, wobei die Verbindungsstäbe im wesentlichen parallel und im Abstand zueinander verlaufen und die Längsbänder parallele, gegenüberliegende Ober- und Unterseiten aufweisen,

wobei die Vielzahl der Befestigungsflecken (18), die mit den Längsbändern verbunden sind, in Zwischenräumen zwischen den Querstäben angeordnet sind und im Abstand zu den Längsbändern derart liegen, daß die Verbindungen zwischen den Befestigungsflecken und den Längsbändern getrennt werden können, und

wobei sich der Bandstreifen (14) in Längsrichtung zwischen den Längsbändern erstreckt

und lösbar an den Unterseiten der Längsbänder und der Befestigungsflecken angeklebt ist,

wodurch die Befestigungsflecken lösbar an dem Bandstreifen nach dem Abtrennen von den Längsbändern kleben bleiben.

4. Verfahren zur Handhabung einer Vielzahl von Befestigungsflecken, enthaltend die folgenden Schritte:

Bereitstellen eines Leiterraumes (12), der wenigstens ein Längsband (42) aufweist, das parallele, einander gegenüberliegende Ober- und Unterseiten hat, wobei der Leiterraum eine Vielzahl von Befestigungsflecken (18) aufweist, die mit dem Längsband verbunden sind und vom Längsband Querabstand haben derart, daß die Verbindungen zwischen den Befestigungsflecken und dem Längsband getrennt werden können, wobei die Befestigungsflecken gegenüberliegende Ober- und Unterseiten (28, 30) aufweisen,

lösbares Ankleben eines Bandstreifens (14) an der Unterseite des Längsbandes und der Befestigungsflecken, und

Trennen der Verbindungen zwischen den Befestigungsflecken und dem Längsband,

wodurch die Befestigungsflecken lösbar an dem Bandstreifen nach dem Auftrennen der genannten Verbindungen kleben bleiben.

5. Verfahren nach Anspruch 4, dadurch gekennzeichnet, daß der Schritt des lösbaren Anklebens des Bandstreifens mittels eines Klebebandes ausgeführt wird.

6. Verfahren nach den Ansprüchen 4 oder 5, enthaltend die folgenden Schritte:

Bereitstellen des Leiterraumes (12), der erste und zweite parallele und im Abstand zueinander angeordnete Längsbänder (42) aufweist, wobei eine Vielzahl von im wesentlichen querlaufenden Verbindungsstäben (16) dazwischen und in im wesentlichen parallelem und im Abstand angeordnetem Verhältnis verlaufen, wobei die Längsbänder parallele gegenüberliegende Ober- und Unterseiten aufweisen, der Leiterraum zwischen den genannten Querstäben die Vielzahl der Befestigungsflecken (18) aufweist, die mit den Längsbändern verbunden sind und von diesen derart beabstandet sind, daß die Verbindungen zwischen den Befestigungsflecken und den Längsbändern getrennt werden können, und

Erstrecken eines Bandstreifens (14) in Längsrichtung längs des Leiterraumes, wobei der Bandstreifen lösbar an den Unterseiten von Längsbändern und Befestigungsflecken angeklebt wird,

wodurch die Befestigungsflecken lösbar an dem Bandstreifen nach dem Abtrennen von den Längsbändern kleben bleiben.

Revendications

1. Cadre conducteur (12) comportant:

au moins une bande d'avance (42) présentant une face supérieure et une face inférieure parallèles et opposées,

plusieurs plaquettes d'assemblage (18) connec-



tées à ladite bande d'avance et espacées latéralement de ladite bande d'avance de manière que les liaisons entre lesdites plaquettes d'assemblage et ladite bande d'avance puissent être séparées, lesdites plaquettes d'assemblage présentant une surface supérieure (28) et une surface inférieure (30) opposées, et

une bande (14) fixée par adhésif et de façon amovible à ladite face inférieure de la bande d'avance et aux surfaces inférieures des plaquettes d'assemblage.

2. Cadre conducteur selon la revendication 1, dans lequel ledit cadre conducteur comporte au moins un composant (32) fixé sur ladite surface supérieure des plaquettes d'assemblage.

3. Cadre conducteur selon la revendication 1 ou 2, comportant:

une première et une seconde bande d'avance (42) parallèles et espacées comprenant plusieurs barrettes de liaison (16) entre elles, disposées perpendiculairement, lesdites barrettes de liaison étant en relation d'une façon générale parallèles et espacées et lesdites bandes d'avance comprenant une face supérieure et une face inférieure parallèles et opposées,

lesdites plusieurs plaquettes d'assemblage (18) étant reliées auxdites bandes d'avance, disposées avec des interstices entre lesdites barrettes de liaison et espacées desdites bandes d'avance de manière que les liaisons entre lesdites plaquettes d'assemblage et lesdites bandes d'avance puissent être séparées, et,

la bande (14) s'étendant dans la direction longitudinale entre lesdites bandes d'avance et étant fixée de façon adhésive et amovible auxdites faces inférieures des bandes d'avance et auxdites surfaces inférieures des plaquettes d'assemblage,

de manière que lesdites plaquettes d'assemblage puissent rester fixées par adhésif et de façon amovible à ladite bande après le détachement desdites bandes d'avance.

4. Procédé de manutention de plusieurs plaquettes d'assemblage, consistant essentiellement:

à disposer un cadre conducteur (12) comprenant au moins une bande d'avance (42) présentant une surface supérieure et une surface inférieure parallèles et opposées, ledit cadre conduc-

teur comprenant plusieurs plaquettes d'assemblage (18) reliées à ladite bande d'avance et espacées latéralement de cette dernière de manière que les liaisons entre lesdites plaquettes d'assemblage et ladite bande d'avance puissent être séparées, lesdites plaquettes d'assemblage présentant une surface supérieure (28) et une surface inférieure (30) opposées,

à fixer de façon adhésive et amovible une bande (14) à ladite face inférieure de la bande d'avance et auxdites surfaces inférieures des plaquettes d'assemblage et

à séparer lesdites liaisons entre lesdites plaquettes d'assemblage et ladite bande d'avance,

de manière que lesdites plaquettes d'assemblage puissent rester fixées par adhésif et de façon amovible à ladite bande après que lesdites liaisons ont été séparées.

5. Procédé selon la revendication 4, dans lequel ladite opération de fixation par adhésif et de façon amovible de ladite bande est effectuée au moyen d'une bande adhésive.

6. Procédé selon la revendication 4 ou 5, consistant également:

à disposer le cadre conducteur (12) comprenant une première et une seconde bande d'avance (42) parallèles et espacées, avec plusieurs barrettes de liaison (16) disposées perpendiculairement entre elles dans une relation parallèle et espacée, lesdites bandes d'avance présentant une surface supérieure et une surface inférieure parallèles et opposées, ledit cadre conducteur comprenant plusieurs desdites plaquettes d'assemblage (18) disposées entre lesdites barrettes de liaison, reliées auxdites bandes d'avance et espacées de ces dernières de manière que les liaisons entre lesdites plaquettes d'assemblage et lesdites bandes d'avance puissent être séparées, et

à disposer dans la direction longitudinale une bande (14) le long dudit cadre conducteur, ladite bande étant fixée par adhésif et de façon amovible sur lesdites surfaces inférieures des bandes d'avance et lesdites surfaces inférieures des plaquettes d'assemblage,

de manière que lesdites plaquettes d'assemblage puissent rester fixées par adhésif et de façon amovible sur ladite bande après le détachement desdites bandes d'avance.

