A Process for Manufacturing a Molded Leadframe

Field of the Invention

This invention relates generally to the field of integrated circuit packaging, and more particularly to a molded leadframe and a process for manufacturing a molded leadframe.

Background of the Invention

Integrated circuit (IC) dies or semiconductor devices are conventionally manufactured by transfer molding, i.e. the die overmolded in a mold compound so as to form a hermetic package that protects the die from the environment. Kapton tape is normally used during the transfer molding process to prevent bleeding of the mold material. After the process is completed, the Kapton tape is removed and thrown away. This results in waste of materials and inherently adds to the production costs.

Figure 1 shows a conventional overmolded IC package 10. In the overmolded IC package 10, there is a leadframe 12 having a plurality of leads 14 and a die receiving area 16. A die 18 is mounted on the die receiving area 16 and bond wires 20 connect the die 18 to the plurality of leads 14. The die 18 is encapsulated in a thermoset compound 22 so as to form the overmolded IC package 10.

After the package 10 is formed, it is often difficult to detect any problems with the electrical interconnections formed by the wire bonded die. For example, one of the problems encountered during the encapsulation of the IC package is deflection of the wire bonds or commonly known as "wire sweep". Wire sweep can cause wire bonds being lifted from the leadframe, wire crossover and shorting. Therefore, one of the important processes in IC packaging is to check or to validate the quality of the wire bonds in the overmolded IC package.

Currently, the approaches to test or validate the wire bonds include destructive testing and non-destructive testing methods. Destructive testing methods involve cross sectioning the IC package to check the wire bond quality. However, a shortcoming of destructive testing methods is that the sectioned IC package can no longer be used after testing.

Non-destructive testing methods are therefore developed to test the IC packages. However, such non-destructive testing methods often require use of specialized equipment such as X-ray scanning machines. Such equipment is costly and also requires long testing time periods. This results in a longer turn around time for product realizations and design changes in the event of new product developments.

More importantly, even if the defective wire bond is detected in the molded IC package, it is no longer possible to re-work the die. This results in wastage of materials and inherently increases the costs of production.

Molded leadframes have been developed for use in IC packaging assembly. However, despite these developments, limitations in IC packaging assembly still exist. In particular, the problems of specific storage requirements of thermoset materials as well as the wastage of Kapton tape still exist.

Therefore, it is desirable to provide a process for manufacturing a molded leadframe such that the molded leadframe can be manufactured, and validated in an inexpensive way and within a short period of time.

Summary of the Invention

An aspect of the invention is an injection molding process for manufacturing a molded leadframe, the process comprises:

a) providing a leadframe strip comprising a plurality of leadframes being arranged in an array, the strip having a plurality of pin gate holes, wherein each of the leadframes has a plurality of leads, each lead having a molding area.

b) loading the leadframe strip into an injection unit; and

c) injecting a mold material into the leadframe strip so as to fill up each molding area to form the molded leadframe.

By "die receiving area", it is meant to include an area on the leadframe on which a semiconductor device or a die may be mounted.

By "leadframe strip", it is meant to include any length of leadframe that has a plated metal layer suitable for forming an electrical interconnect.

By "loading the strip", it is meant to include any process that places, positions, locates, loads, or the like that loads and retains the strip in the mold.

An advantage of injection molding of a molded leadframe is that it enables mass production of molded leadframes which are consistent in quality, and also allows for multiple configurations of leadframe sizes and pin counts.

Further, injection molding of the molded leadframe does not require use of Kapton tape which is required in the transfer molding to prevent mold bleed. This enables reduction in material costs and material wastage.

In an embodiment, the leadframe comprises a half etch area within the thickness of the leadframe, and the mold area is defined by a gap between the lead and the half etch area. An advantage is this enables the molded leadframe to be of the same thickness of the leadframe.

In an embodiment, the injection unit comprises an injection mold having 4 panel cavities, each panel cavity has a plurality of pin point gates being arranged so as to fill up each molding area in a single shot.

In an embodiment, the plurality of pin point gates comprises 16 pin point gates, each of the 16 pin point gates having a diameter in a range between 0.5 mm to 0.8 mm.
In an embodiment, the plurality of the pin gate holes are located at spaced intervals from each other. The advantage is multiple cavities in a mold may be filled up with a single or a balance shot, i.e. the mold material may flow to fill up all the cavities in the mold during mold close.

In an embodiment, the mold material is liquid crystal polymer.

An advantage of using liquid crystal polymer is that it does not compose of halogen elements and is environmentally friendly.

In an embodiment, the leadframe strip comprises 4 panels, each panel having 64 leadframes being arranged in an 8 by 8 matrix array, the strip having 16 pin gate holes.

In an embodiment, there is a molded lead frame obtained according to a process according to an aspect of the invention.

An aspect of the invention is a leadframe strip for manufacturing a molded leadframe, the leadframe strip comprising:

a plurality of panels, each panel having a plurality of leadframes being arranged in an array;

a plurality of pin gate holes located at spaced intervals along an axis of the leadframe strip;

a plurality of locating holes located at spaced intervals along a periphery of each of the plurality of panels; and

each of the panels having a pre-formed sawing line and a sawing fiducial.

The advantage of a leadframe strip having a plurality of panels in which there are no restrictions on the number of cavitations being formed onto the leadframe strip particularly for multi cavitations and Molded Array Package (MAP) type. Each of the plurality of panels can be adapted according to a package size and the size of the raw leadframe. By "cavitation", it is meant to include a cavity designed based on the desired physical characteristics of a molded leadframe.

In an embodiment, each of the plurality of pin gate holes is a through hole, the pin gate hole being substantially rectangular in shape and having a minimum length of 1.25 mm.

In an embodiment, the plurality of panels comprises 4 panels and each panel has 64 lead frames, each of the leadframes spaced apart from each other at a distance of 0.60 mm.

In an embodiment, the leadframe strip has a length of 228 mm, a width of 62.50 mm, and a thickness of 0.25 mm.

In an embodiment, each panel has an area of 37.40 mm by 37.40 mm.

In an embodiment, each of the plurality of leadframes has a die receiving area, a base surface, and a plurality of leads extending from a periphery of the die receiving area;

each of the leads having a first lead surface and a second lead surface opposite the first lead surface; wherein each of the leads comprises a molding area extending from the

first lead surface to the second lead surface, the molding area being substantially an inverted T in shape, the inverted T shaped molding area being for filling plastic.

An aspect of the invention is a molded leadframe strip comprising a leadframe strip according to the second aspect, and a molded plastic material in an embedded connection with the leadframe strip.

An aspect of the invention is a molded leadframe comprising:

a leadframe having a first surface, a second surface opposite the first surface, a die receiving area, and a plurality of leads extending from a periphery of the die receiving area;

each of the leads having a first lead surface and a second lead surface opposite the first lead surface; and

a molded plastic base having a first planar surface, the molded plastic base being in an embedded connection with the leadframe such that the die receiving area and the first lead surface are exposed on a first surface of the leadframe, the exposed first lead surface being for receiving a bond wire for connecting to a semiconductor device, and coplanar with the first planar surface of the molded plastic base.

An advantage is that there is no plastic wall on the exposed first lead surface to obstruct the operation of the wire bond head during wire bonding. As a result, this enables an increase in the speed of the wire bonding process, and hence increases in the productivity of the process of manufacturing the molded leadframe. For example, the speed of the wire bonding process may be increased by about 10 to 15%.

A further advantage is that visual examination of wire bonds can be conducted easily before encapsulation of the wire-bonded die. For example, any defects that may have occurred during the wire bonding process can be detected quickly and easily before the next process, i.e. lid cover encapsulation. In contrast to transfer molding, inspecting of wire bonding defects would require specialized equipment such as X-ray scanning machines.

In an embodiment, the exposed first lead surface has a bond area configured to receive a bond wire for wire bonding.

In an embodiment, the leadframe comprises a second die receiving area, the second die receiving area and the second lead surface being exposed on a second surface of the leadframe, the exposed second lead surface being for receiving a bond wire for connecting to the device.

In an embodiment, the molded plastic base comprises a second planar surface opposite the first planar surface, the second planar surface being coplanar with the exposed second lead surface.

In an embodiment, each of the leads comprises a molding area extending from the first lead surface to the second lead surface, the molding area being substantially an inverted T in shape, the inverted T shaped cavity being for filling plastic to form the embedded connection with the leadframe.

In an embodiment, the height of the inverted T-shaped molding area is equal to the thickness of the leadframe.

An advantage is the thickness of molded leadframe is equal to the thickness of the leadframe, henceforth a reduction in the overall thickness of the IC package after assembly with the die.

In an embodiment, the inverted T-shaped molding area comprises a first portion extending from the second lead surface to within the lead, the first portion having a height of 0.125 mm.

In an embodiment, the height of the leadframe is 0.254 mm.

In an embodiment, the plastic is liquid crystal polymer.

In an embodiment, the molded leadframe is for a Quad Flat No Lead (QFN) package.

In an embodiment, the height of the molded leadframe is substantially equal to the height of the leadframe.

An aspect of the invention is a Micro Electro Mechanical System (MEMS) package comprising a molded leadframe according to an embodiment of the invention.

An aspect of the invention is a light emitting diode (LED) package comprising a molded leadframe according to an embodiment of the invention.

An advantage is that the molded leadframe can be used in applications where the product design requires a non-hermetic or near-hermetic IC package such as for example, a MEMS package or a LED package.

An aspect of the invention is an injection mold for making a plurality of molded leadframes, each molded leadframe according an embodiment of the invention, the injection mold comprising:

a plurality of cavities, each cavity having a plurality of pin point gates for injecting mold material into the injection mold for making the plurality of molded leadframes.

In an embodiment, the plurality of cavities comprises 4 panel cavities, each panel cavity having 16 pin point gates.

Brief Description of the Drawings

In order that the present invention may be fully understood and readily put into practical effect, there shall now be described by way of non-limitative example only preferred embodiments of the present invention, the description being with reference to the accompanying illustrative drawings. In the drawings:

Figure 1 shows a cross sectional view of a known IC package;

Figure 2A illustrates a top view of a molded leadframe according to an embodiment of the invention;

Figure 2B illustrates a cross section view along a cross-section A-A of the molded leadframe of Figure 2A;

Figure 3A shows a lead frame strip (before molding) according to an embodiment of an invention;

Figure 3B shows a side perspective view of the leadframe strip of Figure 3A;

Figure 3C shows a panel of the leadframe strip (before molding) according to an embodiment of the invention;

Figure 3D shows a detailed view of the leadframe strip (before molding) according to an embodiment of the invention;

Figure 4 shows a flow chart illustrating a process for manufacturing a molded leadframe according to an embodiment of the invention;

Figure 5 illustrates the step of injecting a molding material during the process according to an embodiment of an invention;

Figure 6A shows the top view of a molded leadframe strip according to an embodiment of the invention;

Figure 6B is a detailed top view of a molded leadframe according to an embodiment of the invention;

Figure 6C is a cross section view along section B-B of the molded leadframe of Figure 6B;

Figure 7A shows a bottom view of a molded leadframe strip according to an embodiment of the invention;

Figure 7B is a detailed bottom view of a molded leadframe according to an embodiment of the invention;

Figure 7C is a cross section view along section C-C of the molded leadframe of Figure 7B;

Figure 8 is a cross-section view of an IC package including the molded leadframe after assembly with the die according to an embodiment of the invention.

Detailed Description of the Preferred Embodiments

Figure 2A illustrates a top view of a molded leadframe 30 according to an embodiment of the invention. The molded leadframe 30 has a leadframe 32 and a molded plastic base 34 being in an embedded connection with the leadframe 32.

Referring to Figures 2A and 2B, the leadframe 32 has a first surface 36, a second surface 38 opposite the first surface 36, a die receiving area 40, and a plurality of leads 42 extending

from a periphery of the die receiving area 40. The leadframe 32 may be of a thickness of 0.25 mm and have a metal plating such as a metal alloy consisting of NiPdAu or the like.

The second surface 38 may be exposed so as to facilitate thermal transfer of the IC package (after die assembly), i.e. to conduct heat away from the package and onto the printed circuit board upon which the IC package is mounted. Components may also be mounted on the second surface 38 as well as the die receiving area 40.

Each of the leads 42 has a first lead surface 44 and a second lead surface 46 opposite the first lead surface 44. The molded plastic base 34 has a first planar surface 48 and so embedded with the leadframe 32 such that the die receiving area 40 and the first lead surface 44 are exposed on a first surface 36 of the leadframe 32. The exposed first lead surface 44 is for receiving a bond wire for connecting to a semiconductor device, and is coplanar with the first planar surface 48 of the molded plastic base 34. Similarly, the second lead surface 46 may also be exposed so as to receive a bond wire for connecting to a semiconductor device. The molded plastic base 34 may comprise a second planar surface 49 opposite the first planar surface 48. The second planar surface 49 may be coplanar with the exposed second lead surface 46. Advantageously, this increases flexibilities and options of surface mounting on both surfaces of the molded leadframe 30 for future technology requirements and applications.

Each of the leads comprises a molding area 58 extending from the first lead surface 44 to the second lead surface 46. The molding area 58 is defined by a gap 57 in between the lead 42 and a half etch area 59 within the thickness of the leadframe 32. The thickness of the leadframe 32 may be for example, 0.25 mm. The molding area 58 may be substantially an inverted T in shape, the inverted T shaped cavity 58 being for filling plastic to form the embedded connection with the leadframe 32.

The height of the inverted T-shaped molding area may be equal to the height of the leadframe such that after molding, the total height of the molded leadframe is equal to the thickness of the leadframe (before molding). This is an advantage in chip-scale packaging. In particular, consumer electronic products are getting smaller and more compact. Therefore, by reducing the footprint required on a printed circuit board, and the overall height of the IC package, this enables consumer electronic design to become thinner and more compact.

Figure 3A shows a leadframe strip 50 (before molding) according to an embodiment of an invention. The leadframe strip 50 has a plurality of panels 60, each panel 60 having a plurality of leadframes 52 being arranged in an array. As shown in Figure 3A, the leadframe strip 50 may comprise 4 panels 60 and each panel has 64 lead frames 52. Each of the leadframes may be spaced apart from each other at a distance 500 of 0.50 mm, and comprise a length 511 of 4.00 mm and a width 512 of 4.00 mm. The leadframe strip 50 may comprise a length 501 of 228 mm, a width 502 of 62.50 mm as shown in Figure 3A, and a thickness 503 of 0.25 mm as shown in Figure 3B. There may be 256 leadframes 52 in the leadframe strip 50.

Figure 3C shows a detailed view of the panel 60 of the leadframe strip 50 (before molding). Each panel 60 has a pre-formed sawing line 66, a sawing fiducial 68, and a plurality of pin gate holes 54 (also known as pin gate recess holes) located at spaced intervals from each other or along a horizontal or vertical axis of the strip 50. The pin gate holes 54 are being configured to correspond to pin gates of a injection unit. The leadframe strip 50 further comprises a plurality of locating holes 64 located at spaced intervals along a periphery of each of the plurality of panels 60. The locating holes 64 correspond to positioned locator pins on the injection mold so as to provide error proofing for the orientation of the leadframe strip 50 before molding. This is to ensure that the die receiving area 40 is facing the top before closing of the injection mold and injection of mold material into the injection mold.

Figure 3D shows a detailed view of a plurality of leadframes 52 in the panel 60 before molding. Each of the leadframes 52 has a die receiving area 53, and a plurality of leads 56. Each lead 56 has a molding area 58 (in Figures 6C and 7C) where mold material is injected through the pin gate holes 54 to fill up the molding area 58 to form the molded leadframe 30. Each of the plurality of pin gate holes 54 comprises a through hole, the pin gate hole being substantially rectangular in shape and having a minimum length 506 of 1.25 mm. Each of the leadframes is spaced apart from each other at a distance or a half etch width 507 of 0.60 mm. The first lead surface 44 may have a width 508 of 0.20 mm.

The advantage of a leadframe strip having a plurality of panels is that the number of cavitations being formed on a leadframe strip is more than the number of cavitations formed with conventional leadframe structures. By "cavitation", it is meant to include a cavity designed for making a molded leadframe 30.

Figure 4 shows a flow chart illustrating a process 300 for manufacturing a molded leadframe 30 according to an embodiment of the invention. Essentially, the steps of the process 300 comprises providing (302) a leadframe strip 50 (in Figure 3) comprising a plurality of leadframes 52 being arranged in an array, loading (304) the leadframe strip 50 into an injection unit, and injecting (306) a mold material into the leadframe strip 50.

The Injection Unit

The injection unit may be a vertical type injection molding machine that includes a mold comprising an injection mold and a cavity. Other types of injection molding machines can be used, such as for example, horizontal type injection molding machine. An advantage of using the vertical type injection molding machine is that the leadframe strip 50 is able to be placed in a flat position before molding.

The injection mold may comprise 4 panel cavities, each panel cavity has a plurality of pin point gates being arranged to correspond to the pin gate holes so as to fill up each molding area.

The tooling design for the mold includes the injection mold with the ejector system. The injection mold includes a plurality of cavities and16 pin point gates. The gates are designed and located such that it allows the injected material to flow out thus minimizing the extra material exposed or occurred at the parting line. The advantage of having a plurality of cavities in a mold is to enable high volume production because multiple cavities can be filled up in a single shot or a balance shot.

The mold is designed to ensure tight mold fittings the temperature zone of each panel cavity is treated to ensure constant temperature during the injection molding process.

Coplanarity of the leadframe strip is maintained through the tight fittings in the mold during mold close before injecting a mold material into the cavities of the mold.
The process 300 for manufacturing the molded leadframe 30 is described as follows.

Loading the Leadframe Strip

The leadframe strip 50 is loaded into the injection unit by aligning the locating holes 64 of the leadframe strip 50 with the positioned locator pins of the injection mold.

Injection Molding

After the mold is closed to contact, the injection unit will inject mold material such as a plastic resin compound through the machine nozzle top. The plastic resin compound may be a thermoplastic material, for example, a liquid crystal polymer (LCP). As shown in Figure 5, the plastic resin will flow into the mold sprue bush, runner, the pin point gates and then into the pin gate holes 54 of the leadframe strip 50 and the mold cavities or cavitations of the leadframe strip 50. Following the direction of the arrows 509, the plastic resin fills the molding area 58 of each leadframe 52 to form each molded leadframe 30. The mold leadframe strip 70 or the molded array package (MAP) is then ejected from the mold after the mold is cooled down.

Figure 6A shows the top view of the molded array package (MAP) 70 having four molded panels 61. Each molded panel 61 has three positions 517. Figures 6B is a detailed top view of a molded leadframe 30 of the MAP 70, and Figure 6C is a cross section view along section B-B of the molded leadframe 30. The three positions 517 serve as a "fool-proof" system or feature so as to create only one orientation for attaching the lid cover (in lid encapsulation) after the process of die-attach and wire bonding. By having the three positions 517, the errors during the lid encapsulation process can be minimized.

Figure 7A shows a bottom view of a molded leadframe strip 70 of Figure 6A. Figure 7B is a detailed bottom view of a molded leadframe 30, and Figure 7C is a cross section view along section C-C of the molded leadframe 30.

As seen from Figures 6C and 7C, the plastic resin fills the molding area 58 to form the molded leadframe 30. The molded leadframe 30 has a length of 4.00 mm, a width of 4.00 mm, and a height of 0.25 mm, i.e. the height of the leadframe before molding.
Figure 8 is a cross-section view of a IC package including the molded leadframe 30 after assembly with a die 82. The die 82 is wire bonded to the leads 42 via bond wires 84.

An advantage of the exposed first lead surface 44 being coplanar with the first planar surface 48 of the molded plastic base 34 is that this allows the wire bond head to have a greater working area and this allows wire bonding to be done at a faster rate without fear of damaging the bond head or the capillary of the wire bonder.

No Kapton tape is required during injection molding of the molded leadframe unlike otherwise required by the transfer molding process. Consequently, the injection molding process of the molded lead frame reduces material waste and material costs.

An advantage of the exposed die and bond wires after surface mount assembly is that validation of the product can be done visually or with the microscope to check for lifted wire bonds, missing wire bond, etc. This reduces the product cycle time and consequently increases the yield of the product. It will be appreciated that after surface mount assembly the product may undergo further processing to cover or package the exposed die and bond wires.

The molded leadframe 30 is suitable for applications under non-hermetic or near-hermetic environmental conditions such as, sensors, Micro Electro Mechanical Systems (MEMS), Light Emitting Diode (LED) packages. The molded leadframe 30 may also be used in IC packaging applications, secondary assembly processes or the like.

Whilst there has been described in the foregoing description preferred embodiments of the present invention, it will be understood by those skilled in the technology concerned that many variations or modifications in details of design or construction may be made without departing from the present invention.

THE CLAIMS

1. An injection molding process for manufacturing a molded leadframe, the process comprises:

a) providing a leadframe strip comprising a plurality of leadframes being arranged in an array, the leadframe strip having a plurality of pin gate holes, wherein each of the leadframes has a plurality of leads, each lead having a molding area

b) loading the leadframe strip into an injection unit; and

c) injecting a mold material into the leadframe strip so as to fill up each molding area to form the molded leadframe.

2. The process according to claim 1, wherein the injection unit comprises an injection mold having 4 panel cavities, each panel cavity has a plurality of pin point gates being arranged to correspond to the pin gate holes so as to fill up each molding area.

3. The process according to claim 1, wherein the leadframe comprises a half etch area within the thickness of the leadframe, and the mold area is defined by a gap between the lead and the half etch area.

4. The process according to claim 2, wherein the plurality of pin point gates comprises 16 pin point gates, each of the 16 pin point gates having a diameter in a range between 0.5 mm to 0.8 mm.

5. The process according to claim 1, wherein the plurality of the pin gate holes are located at spaced intervals from each other.

6. The process according to claim 2, wherein the plurality of the pin point gates are located at spaced intervals of 9.20 mm from each other.

7. The process according to any one of the preceding claims, wherein the mold material is liquid crystal polymer.

8. The process according to any one of the preceding claims, wherein the strip comprises 4 panels, each panel having 64 leadframes being arranged in an 8 by 8 matrix array, the strip having 16 pin gate holes.

9. A molded leadframe according to the process of claim 1.

10. A leadframe strip for manufacturing a molded leadframe comprising:

a plurality of panels, each panel having a plurality of leadframes being arranged in an array;

a plurality of pin gate holes located at spaced intervals along an axis of the strip;

a plurality of locating holes located at spaced intervals along a periphery of each of the plurality of panels; and

each of the panels having a pre-formed sawing line and a sawing fiducial.

11. The leadframe strip according to claim 10, wherein each of the plurality of leadframes has a die receiving area, a base surface, and a plurality of leads extending from a periphery of the die receiving area;

each of the leads having a first lead surface and a second lead surface opposite the first lead surface; wherein each of the leads comprises a molding area extending from the first lead surface to the second lead surface, the molding area being substantially an inverted T in shape, the inverted T shaped molding area being for filling plastic.

12. The leadframe strip according to claim 10, wherein each of the plurality of pin gate holes comprises a through hole, the pin gate hole being substantially rectangular in shape and having a minimum length of 1.25 mm.

13. The leadframe strip according to any one of claims 10 to 12, wherein the plurality of panels comprises 4 panels and each panel has 64 lead frames, each of the leadframes spaced apart from each other at a distance of 0.60 mm.

14. The leadframe according to claim 13, wherein the leadframe strip has a length of 228 mm, a width of 62.50 mm, and a thickness of 0.25 mm.

15. The leadframe strip according to claim 13, wherein each panel has an area of 37.40 mm by 37.40 mm.

16. A molded leadframe strip comprising a leadframe strip of claim 11, and a molded plastic material in an embedded connection with the leadframe strip.

17. A molded leadframe comprising:

a leadframe having a first surface, a second surface opposite the first surface, a die receiving area, and a plurality of leads extending from a periphery of the die receiving area;

each of the leads having a first lead surface and a second lead surface opposite the first lead surface; and

a molded plastic base having a first planar surface, the molded plastic base being in an embedded connection with the leadframe such that the die receiving area and the first lead surface are exposed on a first surface of the leadframe, the exposed first lead surface being for receiving a bond wire for connecting to a semiconductor device, and coplanar with the first planar surface of the molded plastic base.

18. The molded leadframe of claim 17, wherein the exposed first lead surface has a bond area configured to receive a bond wire during wire bonding.

19. The molded leadframe of claim 17 wherein the leadframe comprises a second die receiving area, the second die receiving area and the second lead surface being exposed on a second surface of the leadframe, the exposed second lead surface being for receiving a bond wire for connecting to the device.

20. The molded leadframe of claim 17, wherein the molded plastic base comprises a second planar surface opposite the first planar surface, the second planar surface being coplanar with the exposed second lead surface.

21. The molded leadframe of claim 17, wherein each of the leads comprises a molding area extending from the first lead surface to the second lead surface, the molding area being substantially an inverted T in shape, the inverted T shaped cavity being for filling plastic to form the embedded connection with the leadframe.

22. The molded leadframe of claim 17, wherein the height of the inverted T-shaped molding area is equal to the height of the leadframe.

23. The molded leadframe of claim 22 wherein the inverted T-shaped molding area comprises a first portion extending from the second lead surface to within the lead, the first portion having a height of 0.125 mm.

24. The molded leadframe of claim 17 wherein the plastic is liquid crystal polymer.

25. The molded leadframe of claim 17 wherein the molded leadframe is for a Quad Flat No Lead (QFN) package having 16 leads.

26. The molded leadframe of any one of the preceding claims wherein the height of the molded leadframe is substantially equal to the height of the leadframe.

27. The molded leadframe of any one of the preceding claims wherein the molded leadframe has a length of 4.00 mm, a width of 4.00 mm, and a height of 0.25 mm.

28. A Micro Electro Mechanical System (MEMS) package comprising a molded leadframe according to claims 17 to 26.

29. A light emitting diode (LED) package comprising a molded leadframe according to claims 17 to 26.

30. An injection mold for making a plurality of molded leadframes, each molded leadframe according to claim 16 to 25, the injection mold comprising:

a plurality of cavities, each cavity having a plurality of pin point gates for injecting mold material into the injection mold for making the plurality of molded leadframes.

31. The injection mold according to claim 29, wherein the plurality of cavities comprises 4 panel cavities, each panel cavity having 16 pin point gates.