The leads 104 may be pre-plated with Ni, Pt, Au or any combination of them. The leads 104 also can be arranged in single or multiple row formats to match multiple levels of stacked die.

Encapsulating the interconnects 210 and partially encapsulating the integrated circuit 102 and the leads 104, is the conformable material 106. The conformable material 106 can have a planar bottom surface. In some embodiments, the bottom portion of the integrated circuit 102, the bottom portion of the leads 104, or both can protrude from the bottom surface of the conformal material 106. The bottom portion of the half-etched portion 212 of the leads 104 can also protrude from the conformal material 106. The conformable material 106 has a low viscosity and, as temperature increases, the viscosity gets lower.

Therefore, the conformable material 106 can be easily pressed over the interconnects 210, above, and around the integrated circuit 102 and the leads 104, and then cured to harden the conformable material 106.

The leads 104 can be any shape and cross-section, such as T shape, trapezoid, L shape, etc, that enhances mechanical locking effect with the conformable material 106. The conformable material 106 is shown only partially encapsulating the half-etched portion 212 of the leads 104.

It has been discovered that the conformable material 106 should be a thermally conductive dielectric material. The conformable material 106 can be made of a B-stage material that can be hardened after curing.

The conformable material 106 should be about 100°C while encapsulating the integrated circuit 102 before curing. The viscosity of the conformable material 106 may be in a range of 10Pa to 2000Pa. It has still further been discovered that the elastic modulus of the conformable material 106 before curing (B-stage) should be less than 300MPa, and it should be greater than 3000MPa after curing.

There should preferably be a difference about 10X before and after curing. The elastic modulus should also drop as temperature increases before and after curing. Above the conformable material 106, a buffer layer 220 is mounted.

The buffer layer 220 is used to compensate for the coefficient of thermal expansion mismatch between the conformable material 106 and an adhesive layer 222 attached above the buffer layer 220. It is preferable that the buffer layer 220 is made of an insulation material.

The adhesive layer 222 may be applied to secure a stiffener 224 above the buffer layer 220. The buffer layer 220, the adhesive layer 222, and the stiffener 224 are preferably thermally conductive to shed excess heat generated by the operation of the integrated circuit 102.

What is claimed is:

1. A method for manufacturing an integrated circuit package system comprising:
providing an integrated circuit;
mounting a lead on the periphery of the integrated circuit;
connecting the integrated circuit to the lead with an interconnect; and
forming a conformable material by pressing the conformable material on the integrated circuit, the lead, and the interconnect.

2. The method as claimed in claim 1 further comprising:
attaching a stiffener to the conformable material.

3. The method as claimed in claim 1 further comprising:
attaching a stiffener to the conformable material with an adhesive layer.

4. The method as claimed in claim 1 further comprising:
attaching a stiffener having a protrusion to the conformable material and having the protrusion in contact with the integrated circuit.

5. A method for manufacturing an integrated circuit package system comprising:
providing an integrated circuit;
mounting a lead having a half-etched portion on the periphery of the integrated circuit;
connecting the integrated circuit to the lead with a bond wire, a solder ball, or a combination thereof; and
forming a conformable material by pressing the conformable material on the integrated circuit, and the lead.

6. The method as claimed in claim 5 further comprising:
mounting the integrated circuit to a die pad having a half-etched portion.

7. The method as claimed in claim 5 wherein:
mounting a lead includes forming the half-etched portion along a side and bottom of the lead, along a side and upper surface of the lead, or a combination thereof.

8. The method as claimed in claim 5 further comprising:
mounting an external interconnect to the lead.

9. The method as claimed in claim 5 further comprising:
connecting the lead to the stiffener with a conductive interconnection.

1~~0~~. An integrated circuit package system comprising:

an integrated circuit;

a lead mounted on the periphery of the integrated circuit;

an interconnect connecting the integrated circuit to the lead; and

a conformable material pressed on the integrated circuit, the lead, and the interconnect with a lower portion of the integrated circuit and the bottom portion of the lead protruding from the bottom surface of the conformal material.

~~11~~2. The system as claimed in claim 1~~0~~ further comprising:

a stiffener attached to the conformable material.

~~12~~3. The system as claimed in claim 1~~0~~ further comprising:

a stiffener attached to the conformable material with an adhesive layer.

~~13. The system as claimed in claim 10 further comprising:~~

~~a stiffener having a protrusion attached to the conformable material and having the protrusion in contact with the integrated circuit.~~

~~14. The system as claimed in claim 10 wherein:~~

~~the lead has a half-etched portion; and~~

~~the interconnect connecting the integrated circuit to the lead is a bond wire, a solder ball, or a combination thereof.~~

~~15. The system as claimed in claim 14 further comprising:~~

~~a die pad having a half-etched portion mounted to the integrated circuit.~~

~~16. The system as claimed in claim 14 wherein:~~

~~the half-etched portion is formed along a side and bottom of the lead, along a side and upper surface of the lead, or a combination thereof.~~

~~17. The system as claimed in claim 14 further comprising:~~

~~an external interconnect mounted to the lead.~~

~~18. The system as claimed in claim 14 further comprising:~~

~~a conductive interconnection connecting the lead to the stiffener.~~