**[0005]** Certain types of sensor packages have incorporated these particular qualities into a relatively small, compact device. There are, for example, sensor packages that have a sensor device, and a processing device that are mounted to opposite sides of a substrate. While these two devices communicate via leads inside of sensor package, the devices are mounted on opposite sides of the substrate. Not only does this configuration act as a limiting factor in the size of the package, but it also requires longer interconnection distances between the devices, which can affect the performance, the functionality, and the flexibility of the sensor package.

**[0006]** Therefore, it would be advantageous to have a sensor package that can collect data and information, but that can also provide a platform for further changes and expansion of these functions. It would also likewise be advantageous for such sensor package to be configured to reduce mechanical stresses on particular areas of the package, and to provide access to the environment for data collection, but that also protects other areas of the package from the environment. Moreover, such sensor packages could still further be configured to employ minimal interconnection lengths between components, such as the interconnection lengths between the sensor devices and the processing devices.

## BRIEF DESCRIPTION OF THE INVENTION

**[0006a]** According to a first aspect, there is provided a sensor package comprising: a metal leadframe comprising a first side, a second side, an upper surface, and a lower surface in opposing relation to the upper surface, wherein the metal leadframe has at least a first tie bar extending from the first side of the metal leadframe and at least a second tie bar extending from the second side of the metal leadframe; a first device disposed on the upper surface of the metal leadframe, the first device comprising a first connective pad proximate the first side of the metal leadframe; a second device disposed on the lower surface of the metal leadframe, the second device comprising a second connective pad proximate the first side of the metal leadframe; a housing in surrounding relation to the second device, the housing comprising a cavity exposing the first device to an environment external to the housing; and a first lead coupled to the first connective pad and the second connective pad, the first lead comprising an end proximate the first side, wherein the first lead receives a wirebond from each of the first connective pad and the second connective pad in a manner that forms a connection between the first device and the second device entirely inside of the housing.

**[0006b]** According to a second aspect, there is provided a sensor package for mounting to the surface of a printed circuit board, said sensor package comprising: a metal leadframe comprising an outer edge in surrounding relation to a placement area having a first side, a second side, and a pair of opposing surfaces, the opposing surfaces comprising an upper surface and a lower surface in planar relation to the upper surface, wherein the metal leadframe has at least a first tie bar extending from the first side of the metal leadframe and at least a second tie bar extending from the second side of the metal leadframe; a sensor disposed on the upper surface of the metal leadframe, the sensor comprising a plurality of sensor devices, each of the sensor devices comprising a connective pad proximate the first side of the placement area a processing device disposed on the lower surface of the metal leadframe, the processing device comprising a connective pad proximate the first side of the placement area, the processing device for processing data from the sensor devices; a housing surrounding the metal leadframe, the housing comprising a portion sealing the processing device from an environment external to the housing, and a cavity exposing at least one of the sensor devices to the environment; and a plurality of leads, one lead coupled to each of the connective pads of the sensor devices, each of the leads comprising an end proximate the first side, wherein the leads receive a wirebond from the connective pads so as to form a connection between the sensor devices and the processing device that is entirely within the housing.

**[0006c]** According to a third aspect, there is provided a sensor package, for mounting to the surface of a printed circuit board, said sensor package comprising: a leadframe comprising an outer edge in surrounding relation to a placement area having a first side, a second side, and a pair of opposing surfaces, the opposing surfaces comprising an upper surface and a lower surface in planar relation to the upper surface; a sensor disposed on the upper surface, the sensor comprising a plurality of sensor devices each of the sensor devices comprising a connective pad proximate the first side of the placement area; a processing device disposed on the lower surface, the processing device comprising a connective pad proximate the first side of the placement area, the processing device for processing data from the sensor devices; a housing surrounding the leadframe, the housing comprising a portion sealing the processing device from an environment external to the housing, and a cavity exposing at least one of the sensor devices to the environment; a plurality of leads, one lead coupled to each of the connective pads of the sensor devices, each of the leads comprising an end proximate the first side, wherein the leads receive a wirebond from the connective pads so as to form a connection between the sensor devices and the

processing device that is entirely within the housing; and an encapsulating gel disposed in the cavity, the encapsulating gel comprising a material having a first state, and a second state with a viscosity that is greater than the viscosity of the first state.

**[0006d]** According to a fourth aspect, there is provided a method for manufacturing a sensor package, the method comprising: forming a metal leadframe comprising an outer edge in surrounding relation to a placement area having a first side, a second side, an upper surface and a lower surface in planar relation to the upper surface; mounting a first sensor device to the upper surface in a manner positioning a first connective pad proximate the first side of the placement area mounting a processing device to the lower surface in a manner positioning a second connective pad proximate the first side of the placement area, wherein the metal leadframe has at least a first tie bar extending from the first side of the metal leadframe and at least a second tie bar extending from the second side of the metal leadframe; forming a housing by over molding the processing device in a manner isolating the processing device from an environment outside of the housing; and wirebonding the first connective pad and the second connective pad to a first lead, the first lead comprising an end proximate the first side, wherein the first lead receives a wirebond from each of the first connective pad and the second connective pad so as to form a connection between the first sensor device and the processing device that is entirely within the housing.

**[0006e]** According to a fifth aspect, there is provided a method for manufacturing a sensor package, the method comprising: forming a metal leadframe comprising an outer edge in surrounding relation to a placement area having a first side, a second side, an upper surface and a lower surface in planar relation to the upper surface; mounting a first sensor device to the upper surface in a manner positioning a first connective pad proximate the first side of the placement area, mounting a processing device to the lower surface in a manner positioning a second connective pad proximate the first side of the placement area, wherein the metal leadframe has at least a first tie bar extending from the first side of the metal leadframe and at least a second tie bar extending from the second side of the metal leadframe; forming a housing by over molding the processing device in a manner isolating the processing device from an environment outside of the housing; and wirebonding the first connective pad and the second connective pad to a first lead, the first lead comprising an end proximate the first side, wherein the first lead receives a wirebond from each of the first connective pad and the second connective pad so as to form a connection between the first sensor device and the processing device that is entirely within the housing; forming a cavity in the housing around the first sensor device to the environment; and sealing the cavity in a manner exposing

the first sensor device to the environment, depositing an encapsulating gel into the cavity, the encapsulating gel comprising a material having a first state and a second state with a viscosity that is greater than the viscosity of the first state.

**[0007]** In one embodiment, a sensor package can comprise a substrate that can comprise a first side, an upper surface, and a lower surface in opposing relation to the upper surface. The sensor package can also comprise a first device disposed on the upper surface, the first device comprising a first connective pad proximate the first side of the substrate. The sensor package can further comprise a second device disposed on the lower surface, the second device comprising a second connective pad proximate the first side of the substrate. The sensor package can yet further comprise a housing in surrounding relation to the second device, the housing comprising a cavity exposing the first device to an environment external to the housing, and a first lead coupled to the first connective pad and the second connective pad, the first lead comprising an end proximate the first side. Moreover, the embodiment of the sensor package can be further described where the first lead can receive a wirebond from

What is claimed is:

1. A sensor package comprising:

a substrate comprising a first side, an upper surface, and a lower surface in opposing relation to the upper surface;

a first device disposed on the upper surface , the first device comprising a first connective pad proximate the first side of the substrate;

a second device disposed on the lower surface, the second device comprising a second connective pad proximate the first side of the substrate;

a housing in surrounding relation to the second device, the housing comprising a cavity exposing the first device to an environment external to the housing; and

a first lead coupled to the first connective pad and the second connective pad, the first lead comprising an end proximate the first side,

wherein the first lead receives a wirebond from each of the first connective pad and the second connective pad in a manner that forms a connection between the first device and the second device entirely inside of the housing.

2. A sensor package according to claim 1, further comprising a leadout coupled to the second device, wherein the leadout extends outside of the housing in a manner that permits electrical connection between the second device and circuitry external to the housing.

3. A sensor package according to any one of the preceding claims, wherein the first device is configured to capture data from the environment.

4. A sensor package according to claim 3, further comprising:

a third device disposed on the upper surface, the third device comprising a third connective pad proximate the first side of the substrate; and

a third lead coupled to the third connective pad, the third lead comprising an end proximate the first side,

wherein the third lead receives a wirebond from the third connective pad and the second device in a manner that forms a connection between the third device and the second device entirely inside of the housing.

5. A sensor package according to claim 4, wherein the third lead is coupled to the second device.

6. A sensor package according to any one of the preceding claims, further comprising:

an encapsulating gel disposed in the cavity, the encapsulating gel comprising a material permitting communication between the first device and the environment; and

a cover positioned over the encapsulating gel, the cover comprising an aperture exposing the cavity to the environment.

7. A sensor package according to claim 6, wherein the material has a first state, and a second state with a viscosity that is greater than the viscosity of the first state.

8. A sensor package according to claims 6 or 7, wherein the cavity comprises a lower portion proximate the upper surface, a wall that extends away from the lower portion, and a shelf disposed on the wall opposite the lower portion, the shelf comprises at least one surface extending into the cavity.

9. A sensor package according to any one of the preceding claims, wherein the first device is for sensing pressure, and the second device is for measuring acceleration.

10. A sensor package according to claim 9, wherein the first device comprises a Backside Absolute Pressure ("BAPS") sensor device.

CLAIMS:

1. A sensor package comprising: a metal leadframe comprising a first side, a second side, an upper surface, and a lower surface in opposing relation to the upper surface, wherein the metal leadframe has at least a first tie bar extending from the first side of the metal leadframe and at least a second tie bar extending from the second side of the metal leadframe; a first device disposed on the upper surface of the metal leadframe, the first device comprising a first connective pad proximate the first side of the metal leadframe; a second device disposed on the lower surface of the metal leadframe, the second device comprising a second connective pad proximate the first side of the metal leadframe; a housing in surrounding relation to the second device, the housing comprising a cavity exposing the first device to an environment external to the housing; and a first lead coupled to the first connective pad and the second connective pad, the first lead comprising an end proximate the first side, wherein the first lead receives a wirebond from each of the first connective pad and the second connective pad in a manner that forms a connection between the first device and the second device entirely inside of the housing.

2. A sensor package according to claim 1, further comprising a leadout coupled to the second device, wherein the leadout extends outside of the housing in a manner that permits electrical connection between the second device and circuitry external to the housing.

3. A sensor package according to claim 1, wherein the first device is configured to capture data from the environment.

4. A sensor package according to claim 3, further comprising: a third device disposed on the upper surface, the third device comprising a third connective pad proximate the first side of the metal leadframe; and a third lead coupled to the third connective pad, the third lead comprising an end proximate the first side, wherein the third lead receives a wirebond from the third connective pad and the second device in a manner that forms a connection between the third device and the second device entirely inside of the housing.

5. A sensor package according to claim 4, wherein the third lead is coupled to the second device.

6. A tensor package according to claim 1, further comprising: an encapsulating gel disposed in the cavity, the encapsulating gel comprising a material permitting communication between the first device and the environment; and a cover positioned over the encapsulating gel, the cover comprising an aperture exposing the cavity to the environment.

7. A sensor package for mounting to the surface of a printed circuit board, said sensor package comprising: a metal leadframe comprising an outer edge in surrounding relation to a placement area having a first side, a second side, and a pair of opposing surfaces, the opposing surfaces comprising an upper surface and a lower surface in planar relation to the upper surface, wherein the metal leadframe has at least a first tie bar extending from the first side of the metal leadframe and at least a second tie bar extending from the second side of the metal leadframe; a sensor disposed on the upper surface of the metal leadframe, the sensor comprising a plurality of sensor devices, each of the sensor devices comprising a connective pad proximate the first side of the placement area a processing device disposed on the lower surface of the metal leadframe, the processing device comprising a connective pad proximate the first side of the placement area, the processing device for processing data from the sensor devices; a housing surrounding the metal leadframe, the housing comprising a portion sealing the processing device from an environment external to the housing, and a cavity exposing at least one of the sensor devices to the environment; and a plurality of leads, one lead coupled to each of the connective pads of the sensor devices, each of the leads comprising an end proximate the first side, wherein the leads receive a wirebond from the connective pads so as to form a connection between the sensor devices and the processing device that is entirely within the housing.

8. A sensor package, for mounting to the surface of a printed circuit board, said sensor package comprising: a leadframe comprising an outer edge in surrounding relation to a placement area having a first side, a second side, and a pair of opposing surfaces, the opposing

surfaces comprising an upper surface and a lower surface in planar relation to the upper surface; a sensor disposed on the upper surface, the sensor comprising a plurality of sensor devices each of the sensor devices comprising a connective pad proximate the first side of the placement area; a processing device disposed on the lower surface, the processing device comprising a connective pad proximate the first side of the placement area, the processing device for processing data from the sensor devices; a housing surrounding the leadframe, the housing comprising a portion sealing the processing device from an environment external to the housing, and a cavity exposing at least one of the sensor devices to the environment; a plurality of leads, one lead coupled to each of the connective pads of the sensor devices, each of the leads comprising an end proximate the first side, wherein the leads receive a wirebond from the connective pads so as to form a connection between the sensor devices and the processing device that is entirely within the housing; and an encapsulating gel disposed in the cavity, the encapsulating gel comprising a material having a first state, and a second state with a viscosity that is greater than the viscosity of the first state.

9. A sensor package according to claim 8, wherein the cavity comprises a lower portion proximate the upper surface, a wall that extends away from the lower portion, and a shelf disposed on the wall opposite the lower portion, the shelf comprises at least one surface extending into the cavity.

10. A sensor package according to claim 9, further comprising a cover positioned over the encapsulating gel, the cover comprising an aperture exposing the cavity to the environment.

11. A sensor package according to claim 7, wherein one of the sensor devices is configured to capture data from the environment.

12. A sensor package according to claim 11, wherein the sensor devices comprise a first device for sensing pressure, and a second device for measuring acceleration.

13. A sensor package according to claim 12, wherein the first device comprises a Backside Absolute Pressure ("BAPS") sensor device.

14. A sensor package according to claim 7, further comprising a leadout coupled to the processing device, the leadout comprising an end proximate the second side, the end for receiving a wirebond from the processing device, wherein the leadout extends out of the housing in a mariner that permits electrical connection of the processing device with circuitry external to the housing.

15. A method for manufacturing a sensor package, the method comprising: forming a metal leadframe comprising an outer edge in surrounding relation to a placement area having a first side, a second side, an upper surface and a lower surface in planar relation to the upper surface; mounting a first sensor device to the upper surface in a manner positioning a first connective pad proximate the first side of the placement area mounting a processing device to the lower surface in a manner positioning a second connective pad proximate the first side of the placement area, wherein the metal leadframe has at least a first tie bar extending from the first side of the metal leadframe and at least a second tie bar extending from the second side of the metal leadframe; forming a housing by over molding the processing device in a manner isolating the processing device from an environment outside of the housing; and wirebonding the first connective pad and the second connective pad to a first lead, the first lead comprising an end proximate the first side, wherein the first lead receives a wirebond from each of the first connective pad and the second connective pad so as to form a connection between the first sensor device and the processing device that is entirely within the housing.

16. A method according to claim 15, further comprising: forming a cavity in the housing around the first sensor device to the environment; and sealing the cavity in a manner exposing the first sensor device to the environment.

17. A method for manufacturing a sensor package, the method comprising: forming a metal leadframe comprising an outer edge in surrounding relation to a placement area having a first

side, a second side, an upper surface and a lower surface in planar relation to the upper surface; mounting a first sensor device to the upper surface in a manner positioning a first connective pad proximate the first side of the placement area, mounting a processing device to the lower surface in a manner positioning a second connective pad proximate the first side of the placement area, wherein the metal leadframe has at least a first tie bar extending from the first side of the metal leadframe and at least a second tie bar extending from the second side of the metal leadframe; forming a housing by over molding the processing device in a manner isolating the processing device from an environment outside of the housing; and wirebonding the first connective pad and the second connective pad to a first lead, the first lead comprising an end proximate the first side, wherein the first lead receives a wirebond from each of the first connective pad and the second connective pad so as to form a connection between the first sensor device and the processing device that is entirely within the housing; forming a cavity in the housing around the first sensor device to the environment; and sealing the cavity in a manner exposing the first sensor device to the environment, depositing an encapsulating gel into the cavity, the encapsulating gel comprising a material having a first state and a second state with a viscosity that is greater than the viscosity of the first state.

18. A method according to claim 17, further comprising mounting a second sensor device to the upper surface in a manner positioning a third connective pad proximate the first side of the placement area and wirebonding the third connective pad and the processing device to a second lead, the second lead comprising an end proximate the first side of the placement area, wherein the second lead receives a wirebond from the third connective pad and the processing device so as to form a connection between the first sensor device and the processing device that is entirely within the housing.

19. A method according to claim 18, wherein the first sensor device is configured to capture data from the environment.

20. A method according to claim 18, further comprising wirebonding the processing device to a leadout, wherein the leadout extends outside of the housing in a manner that permits electrical connection of the processing device to circuitry external to the housing.