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SEMICONDUCTOR DEVICE

Abstract

A semiconductor device includes a semiconductor element, a plurality of leads, and a sealing resin covering the semiconductor element and the plurality of leads. The sealing resin includes a resin reverse surface and first to third resin side surfaces. The plurality of leads include a plurality of first leads aligned in the first direction. Each of the first leads includes a first mounting surface exposed from the resin reverse surface. The first mounting surface reaches the first resin side surface, and is spaced apart from the second resin side surface and the third resin side surface. The first mounting surface has a first length in the second direction. The first length of each of the first leads located at opposite ends in the first direction is longer than the first length of any of a rest of the first leads.

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Background/Summary

TECHNICAL FIELD
[0001] The present disclosure relates to a semiconductor device.
BACKGROUND ART
[0002] JP-A-2022-87155 discloses an example of a conventional semiconductor device. The semiconductor device disclosed in JP-A-2022-87155 includes a semiconductor element, a plurality of leads, and a sealing resin. Each of the leads has a mounting surface exposed from a reverse surface of the sealing resin. The mounting surfaces are aligned along side surfaces of the sealing resin.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0003] FIG. **1** is a perspective view showing a semiconductor device according to a first embodiment of the present disclosure.
[0004] FIG. **2** is a perspective view showing the semiconductor device according to the first embodiment of the present disclosure.
[0005] FIG. **3** is a partial perspective view showing the semiconductor device according to the first embodiment of the present disclosure.
[0006] FIG. **4** is a plan view showing the semiconductor device according to the first embodiment of the present disclosure.
[0007] FIG. **5** is a bottom view showing the semiconductor device according to the first embodiment of the present disclosure.
[0008] FIG. **6** is a front view showing the semiconductor device according to the first embodiment of the present disclosure.
[0009] FIG. **7** is a rear view showing the semiconductor device according to the first embodiment of the present disclosure.
[0010] FIG. **8** is a right-side view showing the semiconductor device according to the first embodiment of the present disclosure.
[0011] FIG. **9** is a left-side view showing the semiconductor device according to the first embodiment of the present disclosure.
[0012] FIG. **10** is a cross-sectional view along line X-X in FIG. **4**.
[0013] FIG. **11** is a cross-sectional view along line XI-XI in FIG. **4**.
[0014] FIG. **12** is a cross-sectional view along line XII-XII in FIG. **4**.
[0015] FIG. **13** is a partially enlarged plan view showing the semiconductor device according to the first embodiment of the present disclosure.
[0016] FIG. **14** is a partially enlarged plan view showing the semiconductor device according to the first embodiment of the present disclosure.
[0017] FIG. **15** is a partially enlarged plan view showing the semiconductor device according to the first embodiment of the present disclosure.
[0018] FIG. **16** is a partially enlarged plan view showing the semiconductor device according to the first embodiment of the present disclosure.

[0019] FIG. **17** is a bottom view showing a first variation of the semiconductor device according to the first embodiment of the present disclosure.
[0020] FIG. **18** is a bottom view showing a semiconductor device according to a second embodiment of the present disclosure.
[0021] FIG. **19** is a bottom view showing a semiconductor device according to a third embodiment of the present disclosure.
[0022] FIG. **20** is a bottom view showing a semiconductor device according to a fourth embodiment of the present disclosure.
[0023] FIG. **21** is a partially enlarged plan view showing a second variation of the semiconductor device according to the first embodiment of the present disclosure.
[0024] FIG. **22** is a partially enlarged plan view showing a third variation of the semiconductor device according to the first embodiment of the present disclosure.
[0025] FIG. **23** is a plan view showing a semiconductor device according to a fifth embodiment of the present disclosure.

DETAILED DESCRIPTION OF EMBODIMENTS

[0026] The following describes preferred embodiments of the present disclosure in detail with reference to the drawings.
[0027] The terms such as “first”, “second” and “third” in the present disclosure are used merely for identification, and are not intended to impose orders on the elements accompanied with these terms.
[0028] In the present disclosure, the phrases “an object A is formed in an object B” and “an object A is formed on an object B” include, unless otherwise specified, “an object A is formed directly in/on an object B” and “an object A is formed in/on an object B with another object interposed between the object A and the object B”. Similarly, the phrases “an object A is disposed in an object B” and “an object A is disposed on an object B” include, unless otherwise specified, “an object A is disposed directly in/on an object B” and “an object A is disposed in/on an object B with another object interposed between the object A and the object B”. Similarly, the phrase “an object A is located on an object B” includes, unless otherwise specified, “an object A is located on an object B in contact with the object B” and “an object A is located on an object B with another object interposed between the object A and the object B”. Further, the phrase “an object A overlaps with an object B as viewed in a certain direction” includes, unless otherwise specified, “an object A overlaps with the entirety of an object B” and “an object A overlaps with a part of an object B”. Further, the phrase “a plane A faces (a first side or a second side) in a direction B” is not limited to the case where the angle of the plane A with respect to the direction B is 90°, but also includes the case where the plane A is inclined to the direction B.

First Embodiment

[0029] FIGS. **1** to **16** show a semiconductor device according to a first embodiment of the present disclosure. A semiconductor device A**1** of the present embodiment includes a semiconductor element **1**, a sealing resin **2**, and a plurality of leads **4** to **9**. The semiconductor device A**1** is provided in a quad flat no-lead package (QFN package), but the basic configuration of the semiconductor device of the present disclosure is not particularly limited.
[0030] FIG. **1** is a perspective view showing the semiconductor device A**1**. FIG. **2** is a perspective view showing the semiconductor device A**1**. FIG. **3** is a partial perspective view showing the semiconductor device A**1**. FIG. **4** is a plan view showing the semiconductor device A**1**. FIG. **5** is a bottom view showing the semiconductor device A**1**. FIG. **6** is a front view showing the semiconductor device A**1**. FIG. **7** is a rear view showing the semiconductor device A**1**. FIG. **8** is a right-side view showing the semiconductor device A**1**. FIG. **9** is a left-side view showing the semiconductor device A**1**. FIG. **10** is a cross-sectional view along line X-X in FIG. **4**. FIG. **11** is a cross-sectional view along line XI-XI in FIG. **4**. FIG. **12** is a cross-sectional view along line XII-XII in FIG. **4**. FIG. **13** is a partially enlarged plan view showing the semiconductor device A**1**. FIG.

14 is a partially enlarged plan view showing the semiconductor device A**1**. FIG. **15** is a partially enlarged plan view showing the semiconductor device A**1**. FIG. **16** is a partially enlarged plan view showing the semiconductor device A**1**.

[0031] In these figures, a thickness direction z is an example of a thickness direction in the present disclosure. A first direction x refers to a direction perpendicular to the thickness direction z. A second direction y refers to the direction perpendicular to the thickness direction z and the first direction x.

Semiconductor Element **1**:

[0032] The semiconductor element **1** performs main electrical functions of the semiconductor device A**1** when the semiconductor device A**1** is mounted on a circuit board or the like to form a part of an electrical circuit. The semiconductor element **1** is not particularly limited to a specific configuration, and may be a large scale integration (LSI) circuit or an integrated circuit (IC), for example. The semiconductor element **1** of the present embodiment has a rectangular shape having two sides extending in the first direction x and two sides extending in the second direction y as viewed in the thickness direction z.

Sealing Resin **2**:

[0033] The sealing resin **2** covers the semiconductor element **1** and a part of each of the leads **4** to **9**. The sealing resin **2** is not particularly limited to a specific configuration, and may be made of a material containing epoxy resin. As shown in FIGS. **1**, **2**, and **4** to **16**, the sealing resin **2** of the present embodiment has a resin obverse surface **21**, a resin reverse surface **22**, a first resin side surface **23**, a second resin side surface **24**, a third resin side surface **25**, and a fourth resin side surface **26**.

[0034] The resin obverse surface **21** faces a z**1** side in the thickness direction z. In the illustrated example, the resin obverse surface **21** is a flat surface having a rectangular shape. The resin reverse surface **22** faces a z**2** side in the thickness direction z. In the illustrated example, the resin reverse surface **22** is a flat surface having a rectangular shape. The first resin side surface **23** is a surface along the first direction x and the thickness direction z, and faces a y**1** side in the second direction y. The second resin side surface **24** is a surface along the second direction y and the thickness direction z, and faces an x**1** side in the first direction x. The third resin side surface **25** is a surface along the second direction y and the thickness direction z, and faces an x**2** side in the first direction x. The fourth resin side surface **26** is a surface along the first direction x and the thickness direction z, and faces a y**2** side in the second direction y.

[0035] In the present embodiment, the length of each of the first resin side surface **23** and the fourth resin side surface **26** in the first direction x is longer than the length of each of the second resin side surface **24** and the third resin side surface **25** in the second direction y.

[0036] The leads **4** to **9** have functions of supporting the semiconductor element **1** and forming conductive paths to the semiconductor element **1**, for example. The specific configuration of the leads **4** to **9** is not particularly limited. The leads **4** to **9** are made of a material containing any of copper (Cu), nickel (Ni), iron (Fe), and alloys of these metals, for example. In the following description, the leads **4** to **9** are distinguished as a plurality of first leads **4**, a plurality of second leads **5**, a plurality of third leads **6**, a plurality of fourth leads **7**, a plurality of corner leads **8**, and a center lead **9**.

First Leads **4**:

[0037] As shown in FIGS. **1** to **6**, and **12** to **14**, the first leads **4** are aligned in the first direction x. Each of the first leads **4** has a first thick portion **41**, a first thin portion **42**, a first mounting surface **43**, and a first end surface **44**.

[0038] The first thick portion **41** is thicker than the other portion (the first thin portion **42**) of the first lead **4** in the thickness direction z. The first thick portion **41** has the first mounting surface **43** and the first end surface **44**. The first thin portion **42** is thinner than the other portion (the first thick portion **41**) of the first lead **4** in the thickness direction z, and is spaced apart from the resin reverse

surface **22** to the z**1** side in the thickness direction z. In the present embodiment, the semiconductor element **1** is mounted on the first thin portion **42**. The shape of the first thin portion **42** as viewed in the thickness direction z is appropriately designed according to, for example, the position at which the semiconductor element **1** is mounted.

[0039] The first mounting surface **43** faces the z**2** side in the thickness direction z, and is exposed from the resin reverse surface **22** of the sealing resin **2**. In the illustrated example, the first mounting surface **43** has a shape that extends in the second direction y. In the illustrated example, the first mounting surface **43** is flush with the resin reverse surface **22**. The first mounting surface **43** reaches the first resin side surface **23**, and is spaced apart from the second resin side surface **24**, the third resin side surface **25**, and the fourth resin side surface **26**.

[0040] The first end surface **44** faces the y**1** side in the second direction y, and is exposed from the first resin side surface **23** of the sealing resin **2**. In the illustrated example, the first mounting surface **43** is connected to the first end surface **44**. However, there may be a recessed surface or the like interposed between the first mounting surface **43** and the first end surface **44**. Each of the first mounting surface **43** and the first end surface **44** may be provided with a plating layer (not illustrated) containing tin (Sn), for example. In the illustrated example, the first end surface **44** is flush with the first resin side surface **23**.

[0041] Array pitches P**1** between the first mounting surfaces **43** of the first leads **4** are not particularly limited. In the illustrated example, the array pitches P**1** between the first mounting surfaces **43** are constant. In addition, widths W**1**, which are the dimensions of the first mounting surfaces **43** in the first direction x, are not particularly limited. In the illustrated example, the widths W**1** of the first mounting surfaces **43** are uniform.

[0042] First lengths L**1**, which are the lengths of the first leads **4** in the second direction y, are such that the first length L**1** of each of the first leads **4** located at opposite ends in the first direction x is longer than the first length L**1** of any of the rest of the first leads **4**. In other words, the first length L**1** of each of the first leads **4** flanked by the two first leads **4** located at opposite ends in the first direction x is shorter than the first length L**1** of each of the first leads **4** located at opposite ends in the first direction x.

[0043] In the illustrated example, the first lengths L**1** of the first leads **4** are such that the first length L**1** of a first lead **4** located more outward in the first direction x is longer than the first length L**1** of a first lead **4** located closer to the center in the first direction x. That is, in a comparison between the first lengths L**1** of two first leads **4** adjacent to each other, the first length L**1** of the first lead **4** located outward in the first direction x is longer than the first length L**1** of the first lead **4** located inward in the first direction x.

Second Leads **5**:

[0044] As shown in FIGS. **2** to **5**, **8**, **10**, **13**, and **15**, the second leads **5** are aligned in the second direction y. Each of the second leads **5** has a second thick portion **51**, a second thin portion **52**, a second mounting surface **53**, and a second end surface **54**.

[0045] The second thick portion **51** is thicker than the other portion (the second thin portion **52**) of the second lead **5** in the thickness direction z. The second thick portion **51** has the second mounting surface **53** and the second end surface **54**. The second thin portion **52** is thinner than the other portion (the second thick portion **51**) of the second lead **5** in the thickness direction z, and is spaced apart from the resin reverse surface **22** to the z**1** side in the thickness direction z. In the present embodiment, the semiconductor element **1** is mounted on the second thin portion **52**. The shape of the second thin portion **52** as viewed in the thickness direction z is appropriately designed according to, for example, the position at which the semiconductor element **1** is mounted.

[0046] The second mounting surface **53** faces the z**2** side in the thickness direction z, and is exposed from the resin reverse surface **22** of the sealing resin **2**. In the illustrated example, the second mounting surface **53** has a shape that extends in the first direction x. In the illustrated example, the second mounting surface **53** is flush with the resin reverse surface **22**. The second

mounting surface **53** reaches the second resin side surface **24**, and is spaced apart from the first resin side surface **23**, the fourth resin side surface **26**, and the third resin side surface **25**.

[0047] The second end surface **54** faces the x**1** side in the first direction x, and is exposed from the second resin side surface **24** of the sealing resin **2**. In the illustrated example, the second mounting surface **53** is connected to the second end surface **54**. However, there may be a recessed surface or the like interposed between the second mounting surface **53** and the second end surface **54**. Each of the second mounting surface **53** and the second end surface **54** may be provided with a plating layer (not illustrated) containing tin (Sn), for example. In the illustrated example, the second end surface **54** is flush with the second resin side surface **24**.

[0048] Array pitches P**2** between the second mounting surfaces **53** of the second leads **5** are not particularly limited. In the illustrated example, a pair of second leads **5** are disposed on one side of the center lead **9** in the second direction y and another pair of second leads (**5**) are disposed on the other side of the center lead **9** in the second direction y. The array pitch P**2** between the two second mounting surfaces **53** on the y**1** side in the second direction y is the same as the array pitch P**2** between the two second mounting surfaces **53** on the y**2** side in the second direction y. In addition, widths W**2**, which are the dimensions of the second mounting surfaces **53** in the second direction y, are not particularly limited. In the illustrated example, the widths W**2** of the second mounting surfaces **53** are uniform.

[0049] Second lengths L**2**, which are the lengths of the second leads **5** in the first direction x, are not particularly limited, and may be uniform in the present embodiment. In the illustrated example, the second length L**2** of each second lead **5** is shorter than the first length L**1** of any of the first leads **4**.

Third Leads **6**:

[0050] As shown in FIGS. **2** to **5**, **8**, **10**, **13**, and **15**, the third leads **6** are aligned in the second direction y. Each of the third leads **6** has a third thick portion **61**, a third thin portion **62**, a third mounting surface **63**, and a third end surface **64**.

[0051] The third thick portion **61** is thicker than the other portion (the third thin portion **62**) of the third lead **6** in the thickness direction z. The third thick portion **61** has the third mounting surface **63** and the third end surface **64**. The third thin portion **62** is thinner than the other portion (the third thick portion **61**) of the third lead **6** in the thickness direction z, and is spaced apart from the resin reverse surface **22** to the z**1** side in the thickness direction z. In the present embodiment, the semiconductor element **1** is mounted on the third thin portion **62**. The shape of the third thin portion **62** as viewed in the thickness direction z is appropriately designed according to, for example, the position at which the semiconductor element **1** is mounted.

[0052] The third mounting surface **63** faces the z**2** side in the thickness direction z, and is exposed from the resin reverse surface **22** of the sealing resin **2**. In the illustrated example, the third mounting surface **63** has a shape that extends in the first direction x. In the illustrated example, the third mounting surface **63** is flush with the resin reverse surface **22**. The third mounting surface **63** reaches the third resin side surface **25**, and is spaced apart from the first resin side surface **23**, the fourth resin side surface **26**, and the second resin side surface **24**.

[0053] The third end surface **64** faces the x**2** side in the first direction x, and is exposed from the third resin side surface **25** of the sealing resin **2**. In the illustrated example, the third mounting surface **63** is connected to the third end surface **64**. However, there may be a recessed surface or the like interposed between the third mounting surface **63** and the third end surface **64**. Each of the third mounting surface **63** and the third end surface **64** may be provided with a plating layer (not illustrated) containing tin (Sn), for example. In the illustrated example, the third end surface **64** is flush with the third resin side surface **25**.

[0054] Array pitches P**3** between the third mounting surfaces **63** of the third leads **6** are not particularly limited. In the illustrated example, two third leads **6** are disposed on one side of the center lead **9** in the second direction y and another two third leads **6** are disposed on the other side

of the center lead **9** in the second direction y. The array pitch P**3** between the two third mounting surfaces **63** on the y**1** side in the second direction y is the same as the array pitch P**3** between the two third mounting surfaces **63** on the y**2** side in the second direction y. In addition, widths W**3**, which are the dimensions of the third mounting surfaces **63** in the second direction y, are not particularly limited. In the illustrated example, the widths W**3** of the third mounting surfaces **63** are uniform.

[0055] Third lengths L**3**, which are the lengths of the third leads **6** in the first direction x, are not particularly limited, and may be uniform in the present embodiment. In the illustrated example, the third length L**3** of each third lead **6** is shorter than the first length L**1** of any of the first leads **4**.

Fourth Leads **7**:

[0056] As shown in FIGS. **2** to **5**, **7**, **12**, **15**, and **16**, the fourth leads **7** are aligned in the first direction x. Each of the fourth leads **7** has a fourth thick portion **71**, a fourth thin portion **72**, a fourth mounting surface **73**, and a fourth end surface **74**.

[0057] The fourth thick portion **71** is thicker than the other portion (the fourth thin portion **72**) of the fourth lead **7** in the thickness direction z. The fourth thick portion **71** has the fourth mounting surface **73** and the fourth end surface **74**. The fourth thin portion **72** is thinner than the other portion (the fourth thick portion **71**) of the fourth lead **7** in the thickness direction z, and is spaced apart from the resin reverse surface **22** to the z**1** side in the thickness direction z. In the present embodiment, the semiconductor element **1** is mounted on the fourth thin portion **72**. The shape of the fourth thin portion **72** as viewed in the thickness direction z is appropriately designed according to, for example, the position at which the semiconductor element **1** is mounted.

[0058] The fourth mounting surface **73** faces the z**2** side in the thickness direction z, and is exposed from the resin reverse surface **22** of the sealing resin **2**. In the illustrated example, the fourth mounting surface **73** has a shape that extends in the second direction y. In the illustrated example, the fourth mounting surface **73** is flush with the resin reverse surface **22**. The fourth mounting surface **73** reaches the fourth resin side surface **26**, and is spaced apart from the second resin side surface **24**, the third resin side surface **25**, and the first resin side surface **23**.

[0059] The fourth end surface **74** faces the y**2** side in the second direction y, and is exposed from the fourth resin side surface **26** of the sealing resin **2**. In the illustrated example, the fourth mounting surface **73** is connected to the fourth end surface **74**. However, there may be a recessed surface or the like interposed between the fourth mounting surface **73** and the fourth end surface **74**. Each of the fourth mounting surface **73** and the fourth end surface **74** may be provided with a plating layer (not illustrated) containing tin (Sn), for example. In the illustrated example, the fourth end surface **74** is flush with the fourth resin side surface **26**.

[0060] Array pitches P**4** between the fourth mounting surfaces **73** of the fourth leads **7** are not particularly limited. In the illustrated example, the array pitches P**4** between the fourth mounting surfaces **73** are constant. In addition, widths W**4**, which are the dimensions of the fourth mounting surfaces **73** in the first direction x, are not particularly limited. In the illustrated example, the widths W**4** of the fourth mounting surfaces **73** are uniform.

[0061] Fourth lengths L**4**, which are the lengths of the fourth leads **7** in the second direction y, are such that the fourth length L**4** of each of the fourth leads **7** located at opposite ends in the first direction x is longer than the fourth length L**4** of any of the rest of the fourth leads **7**. In other words, the fourth length L**4** of each of the fourth leads **7** flanked by the two fourth leads **7** located at opposite ends in the first direction x is shorter than the fourth length L**4** of each of the fourth leads **7** located at opposite ends in the first direction x.

[0062] In the illustrated example, the fourth lengths L**4** of the fourth leads **7** are such that the fourth length L**4** of a fourth lead **7** located more outward in the first direction x is longer than the fourth length L**4** of a fourth lead **7** located closer to the center in the first direction x. That is, in a comparison between the fourth lengths L**4** of two fourth leads **7** adjacent to each other, the fourth length L**4** of the fourth lead **7** located outward in the first direction x is longer than the fourth

length L**4** of the fourth lead **7** located inward in the first direction x.
[0063] In the illustrated example, the plurality of first leads **4** and the plurality of fourth leads **7** include a first lead **4** and a fourth lead **7** that are located at the same position in the first direction x, and the first length L**1** of the first lead **4** is equal to the fourth length L**4** of the fourth lead **7**.
Corner Leads **8**:
[0064] As shown in FIGS. **1** to **9**, and **13** to **16**, the corner leads **8** are disposed at the positions near the four corners of the sealing resin **2** as viewed in the thickness direction z. Two corner leads **8** flank the first leads **4** in the first direction x. The other two corner leads **8** flank the fourth leads **7** in the first direction x.
[0065] Each of the corner leads **8** has a corner thick portion **81**, a corner thin portion **82**, a corner mounting surface **83**, a first corner end surface **841**, and a second corner end surface **842**.
[0066] The corner thick portion **81** is thicker than the other portion (the corner thin portion **82**) of the corner lead **8** in the thickness direction z. The corner thick portion **81** has the corner mounting surface **83**, the first corner end surface **841**, and the second corner end surface **842**. The corner thin portion **82** is thinner than the other portion (the corner thick portion **81**) of the corner lead **8** in the thickness direction z, and is spaced apart from the resin reverse surface **22** to the z**1** side in the thickness direction z. In the present embodiment, the semiconductor element **1** is mounted on the corner thin portion **82**. The shape of the corner thin portion **82** as viewed in the thickness direction z is appropriately designed according to, for example, the position at which the semiconductor element **1** is mounted.
[0067] The corner mounting surface **83** faces the z**2** side in the thickness direction z, and is exposed from the resin reverse surface **22** of the sealing resin **2**. In the present embodiment, the corner mounting surface **83** has a first portion **831** and a second portion **832**. The first portion **831** reaches the first resin side surface **23** or the fourth resin side surface **26**, and is spaced apart from the second resin side surface **24** and the third resin side surface **25**. The second portion **832** reaches the second resin side surface **24** or the third resin side surface **25**, and is spaced apart from the first resin side surface **23** and the fourth resin side surface **26**. The first portion **831** and the second portion **832** are connected to each other at their respective ends. In the illustrated example, the corner mounting surface **83** has an L-shape as viewed in the thickness direction z. In the illustrated example, a length Lc**1**, which is the length of the corner mounting surface **83** in the second direction y, is longer than a length Lc**2**, which is the length of the corner mounting surface **83** in the first direction x. Note that the shape and size of the corner mounting surface **83** are not particularly limited.
[0068] The first corner end surface **841** faces in the second direction y, and is exposed from the first resin side surface **23** or the fourth resin side surface **26**. In the illustrated example, the first corner end surface **841** is flush with the first resin side surface **23** or the fourth resin side surface **26**. The second corner end surface **842** faces in the first direction x, and is exposed from the second resin side surface **24** or the third resin side surface **25**. In the illustrated example, the second corner end surface **842** is flush with the second resin side surface **24** or the third resin side surface **25**.
[0069] In the corner lead **8** shown in FIG. **13**, the length Lc**1** of the corner mounting surface **83** in the second direction y is longer than the first length L**1** of each first lead **4**. The length Lc**2** of the corner mounting surface **83** in the first direction x is equal to the second length L**2** of each second lead **5**.
[0070] In the corner lead **8** shown in FIG. **13**, an array pitch Pc**1** between the first mounting surface **43** of the first lead **4** closest to the x**1** side in the first direction x and the first portion **831** is equal to the array pitch P**1** between the first mounting surfaces **43** of the first leads **4**. In addition, an array pitch Pc**2** between the second mounting surface **53** of the second lead **5** closest to the y**1** side in the second direction y and the second portion **832** is equal to the array pitch P**2** between the second mounting surfaces **53** of the second leads **5**.
[0071] In the corner lead **8** shown in FIG. **14**, the length Lc**1** of the corner mounting surface **83** in

the second direction y is longer than the first length L**1** of each first lead **4**. The length Lc**2** of the corner mounting surface **83** in the first direction x is equal to the third length L**3** of each third lead **6**.

[0072] In the corner lead **8** shown in FIG. **14**, the array pitch Pc**1** between the first mounting surface **43** of the first lead **4** closest to the x**2** side in the first direction x and the first portion **831** is equal to the array pitch P**1** between the first mounting surfaces **43** of the first leads **4**. In addition, an array pitch Pc**3** between the third mounting surface **63** of the third lead **6** closest to the y**1** side in the second direction y and the second portion **832** is equal to the array pitch P**3** between the third mounting surfaces **63** of the third leads **6**.

[0073] In the corner lead **8** shown in FIG. **15**, the length Lc**1** of the corner mounting surface **83** in the second direction y is longer than the fourth length L**4** of each fourth lead **7**. The length Lc**2** of the corner mounting surface **83** in the first direction x is equal to the second length L**2** of each second lead **5**.

[0074] In the corner lead **8** shown in FIG. **15**, an array pitch Pc**4** between the fourth mounting surface **73** of the fourth lead **7** closest to the x**1** side in the first direction x and the first portion **831** is equal to the array pitch P**4** between the fourth mounting surfaces **73** of the fourth leads **7**. In addition, the array pitch Pc**2** between the second mounting surface **53** of the second lead **5** closest to the y**2** side in the second direction y and the second portion **832** is equal to the array pitch P**2** between the second mounting surfaces **53** of the second leads **5**.

[0075] In the corner lead **8** shown in FIG. **16**, the length Lc**1** of the corner mounting surface **83** in the second direction y is longer than the fourth length L**4** of each fourth lead **7**. The length Lc**2** of the corner mounting surface **83** in the first direction x is equal to the third length L**3** of each third lead **6**.

[0076] In the corner lead **8** shown in FIG. **16**, the array pitch Pc**4** between the fourth mounting surface **73** of the fourth lead **7** closest to the x**2** side in the first direction x and the first portion **831** is equal to the array pitch P**4** between the fourth mounting surfaces **73** of the fourth leads **7**. In addition, the array pitch Pc**3** between the third mounting surface **63** of the third lead **6** closest to the y**2** side in the second direction y and the second portion **832** is equal to the array pitch P**3** between the third mounting surfaces **63** of the third leads **6**.

Center Lead **9**:

[0077] As shown in FIGS. **1** to **5**, **8**, **9**, **11**, and **12**, the center lead **9** is disposed between the second leads **5** or between the third leads **6** in the second direction y. In the illustrated example, the center lead **9** overlaps with the center of the semiconductor device A**1** (the sealing resin **2**) in the second direction y. In the illustrated example, the center lead **9** has a center thick portion **911**, a center thick portion **912**, a center thick portion **913**, a center thin portion **921**, a center thin portion **922**, a center mounting surface **931**, a center mounting surface **932**, a center mounting surface **933**, a center end surface **941**, and a center end surface **942**.

[0078] The center mounting surface **931**, the center mounting surface **932**, and the center mounting surface **933** are thicker than the other portions (the center thin portion **921** and the center thin portion **922**) of the center lead **9** in the thickness direction z. The center thick portion **911** has the center mounting surface **931** and the center end surface **941**. The center thick portion **912** has the center mounting surface **932** and the center end surface **942**. The center thick portion **913** has the center mounting surface **933**. The center thick portion **911** is disposed on the x**1** side in the first direction x. The center thick portion **912** is disposed on the x**2** side in the first direction x. The center thick portion **913** is disposed at the center in the first direction x.

[0079] The center thin portion **921** and the center thin portion **922** are thinner than the other portions (the center thick portion **911**, the center thick portion **912**, and the center thick portion **913**) of the center lead **9** in the thickness direction z, and are spaced apart from the resin reverse surface **22** to the z**1** side in the thickness direction z. In the present embodiment, the semiconductor element **1** is mounted on the center thin portion **921** and the center thin portion **922**.

[0080] In the illustrated example, the length of the center mounting surface **931** in the first direction x is equal to the second length L**2** of the second mounting surface **53** of each second lead **5**. The length of the center mounting surface **932** in the first direction x is equal to the third length L**3** of the third mounting surface **63** of each third lead **6**. The array pitch between the center mounting surface **931** and a second mounting surface **53** adjacent thereto in the second direction y is equal to the array pitch P**2** between the second mounting surfaces **53**. The array pitch between the center mounting surface **932** and a third mounting surface **63** adjacent thereto in the second direction y is equal to the array pitch P**3** between the third mounting surfaces **63**.
[0081] Next, advantages of the semiconductor device A**1** will be described.
[0082] When the semiconductor device A**1** is mounted on a circuit board, for example, the first mounting surfaces **43** of the leads **4** are electrically bonded to the circuit board via conductive bonding members such as solder. Similarly, the mounting surfaces of the leads **5** to **9** are also electrically bonded to the circuit board via conductive bonding members. During the use of the semiconductor device A**1**, these conductive bonding members may be subjected to thermal stress or the like. The test conducted by the inventors has shown that, out of the conductive bonding members bonded to the first mounting surfaces **43** of the first leads **4**, the conductive bonding members bonded to the first mounting surfaces **43** located at opposite ends in the first direction x tend to be susceptible to the largest thermal stress. The test has also shown that the conductive bonding members located near the four corners of the sealing resin **2** as viewed in the thickness direction z tend to be susceptible to large thermal stress.
[0083] According to the present embodiment, as shown in FIG. **5**, the first lengths L**1**, which are the lengths of the first leads **4** in the second direction y, are such that the first length L**1** of each of the first leads **4** located at opposite ends in the first direction x is longer than the first length L**1** of any of the rest of the first leads **4**. In other words, the first length L**1** of each of the first leads **4** flanked by the two first leads **4** located at opposite ends in the first direction x is shorter than the first length L**1** of each of the first leads **4** located at opposite ends in the first direction x. This configuration can suppress excessive stress on the conductive bonding members bonded to the first mounting surfaces **43** located at opposite ends in the first direction x.
[0084] In the illustrated example, the first lengths L**1** of the first leads **4** are such that the first length L**1** of a first lead **4** located more outward in the first direction x is longer than the first length L**1** of a first lead **4** located closer to the center in the first direction x. That is, in a comparison between the first lengths L**1** of two first leads **4** adjacent to each other, the first length L**1** of the first lead **4** located outward in the first direction x is longer than the first length L**1** of the first lead **4** located inward in the first direction x. With this configuration, the stress generated in the conductive bonding members bonded to the first mounting surfaces **43** can be reduced in a well-balanced manner.
[0085] According to the present embodiment, as shown in FIG. **5**, the fourth lengths L**4**, which are the lengths of the fourth leads **7** in the second direction y, are such that the fourth length L**4** of each of the fourth leads **7** located at opposite ends in the first direction x is longer than the fourth length L**4** of any of the rest of the fourth leads **7**. In other words, the fourth length L**4** of each of the fourth leads **7** flanked by the two fourth leads **7** located at opposite ends in the first direction x is shorter than the fourth length L**4** of each of the fourth leads **7** located at opposite ends in the first direction x. This configuration can suppress excessive stress on the conductive bonding members bonded to the fourth mounting surfaces **73** located at opposite ends in the first direction x.
[0086] In the illustrated example, the fourth lengths L**4** of the fourth leads **7** are such that the fourth length L**4** of a fourth lead **7** located more outward in the first direction x is longer than the fourth length L**4** of a fourth lead **7** located closer to the center in the first direction x. That is, in a comparison between the fourth lengths L**4** of two fourth leads **7** adjacent to each other, the fourth length L**4** of the fourth lead **7** located outward in the first direction x is longer than the fourth length L**4** of the fourth lead **7** located inward in the first direction x. With this configuration, the

stress generated in the conductive bonding members bonded to the fourth mounting surfaces **73** can be reduced in a well-balanced manner.

[0087] Each of the corner mounting surfaces **83** has a first portion **831** and a second portion **832**. The first portion **831** reaches the first resin side surface **23** or the fourth resin side surface **26**, and is spaced apart from the second resin side surface **24** and the third resin side surface **25**. The second portion **832** reaches the second resin side surface **24** or the third resin side surface **25**, and is spaced apart from the first resin side surface **23** and the fourth resin side surface **26**. The first portion **831** and the second portion **832** are connected to each other at their respective ends. Thus, the corner mounting surfaces **83** are configured to be spaced apart from the corners at each of which two of the first resin side surface **23**, the second resin side surface **24**, the third resin side surface **25**, and the fourth resin side surface **26** are connected to each other. This makes it possible to suppress excessive stress on the conductive bonding members bonded to the corner mounting surfaces **83**.

[0088] In the corner lead **8** shown in FIG. **13**, an array pitch Pc**1** between the first mounting surface **43** of the first lead **4** closest to the x**1** side in the first direction x and the first portion **831** is equal to the array pitch P**1** between the first mounting surfaces **43**. This makes it possible to suppress excessive stress on one of the conductive bonding members bonded to the first mounting surfaces **43** and the first portion **831**. This advantage can also be obtained by the relationship between the array pitch Pc**1** and the array pitch P**1** shown in FIG. **14**, the relationship between the array pitch Pc**4** and the array pitch P**4** shown in FIG. **15**, and the relationship between the array pitch Pc**4** and the array pitch P**4** shown in FIG. **16**.

[0089] In addition, as shown in FIG. **13**, the array pitch Pc**2** between the second mounting surface **53** of the second lead **5** closest to the y**1** side in the second direction y and the second portion **832** is equal to the array pitch P**2** between the second mounting surfaces **53** of the second leads **5**. This makes it possible to suppress excessive stress on one of the conductive bonding members bonded to the second mounting surfaces **53** and the second portion **832**. This advantage can also be obtained by the relationship between the array pitch Pc**3** and the array pitch P**3** shown in FIG. **14**, the relationship between the array pitch Pc**2** and the array pitch P**2** shown in FIG. **15**, and the relationship between the array pitch Pc**3** and the array pitch P**3** shown in FIG. **16**.

[0090] As shown in FIGS. **13** to **16**, a width Wc**1** of each first portion **831** is equal to the width W**1** of each first mounting surface **43** or the width W**4** of each fourth mounting surface **73**. A width Wc**2** of each second portion **832** is equal to the width W**2** of each second mounting surface **53** or the width W**3** of each third mounting surface **63**. This makes it possible to further uniformize the stress generated in the conductive bonding members bonded to these mounting surfaces.

[0091] FIGS. **17** to **20** show variations and other embodiments of the present disclosure. In these figures, elements that are the same as or similar to those in the above embodiment are provided with the same reference numerals as in the above embodiment. The configurations of the elements in each variation and each embodiment can be combined as appropriate as long as the combination does not cause technical inconsistency.

First Variation of the First Embodiment

[0092] FIG. **17** shows a first variation of the semiconductor device A**1**. A semiconductor device A**11** of the present variation is different from the above example in the configurations of the first leads **4** and the fourth leads **7**.

[0093] In the present variation, the first lengths L**1** of the first leads **4** other than those of the first leads **4** located at opposite ends in the first direction x are equal. The first length L**1** of each of the first leads **4** located at opposite ends in the first direction x is longer than the first length L**1** of any of the rest of the first leads **4**.

[0094] In the present variation, the fourth lengths L**4** of the fourth leads **7** other than those of the fourth leads **7** located at opposite ends in the first direction x are equal. The fourth length L**4** of each of the fourth leads **7** located at opposite ends in the first direction x is longer than the fourth length L**4** of any of the rest of the fourth leads **7**.

[0095] The present variation can also suppress excessive stress on the conductive bonding members used for mounting. As can be understood from the present variation, various changes can be made to the configuration where the first length L**1** of each of the first leads **4** located at opposite ends in the first direction x is longer than the first length L**1** of any of the rest of the first leads **4**. Various changes can also be made to the configuration where the fourth length L**4** of each of the fourth leads **7** located at opposite ends in the first direction x is longer than the fourth length L**4** of any of the rest of the fourth leads **7**.

Second Embodiment

[0096] FIG. **18** shows a semiconductor device according to a second embodiment of the present disclosure. A semiconductor device A**2** of the present embodiment is different from the above embodiment in the configurations of the second leads **5** and the third leads **6**.

[0097] In the present embodiment, the second length L**2** of each of the second leads **5** located at opposite ends in the second direction y is longer than the second length L**2** of any of the rest of the second leads **5**. In other words, the second length L**2** of each of the second leads **5** flanked by the two second leads **5** located at opposite ends in the second direction y is shorter than the second length L**2** of each of the second leads **5** located at opposite ends in the second direction y.

[0098] In the illustrated example, the second lengths L**2** of the second leads **5** are such that the second length L**2** of a second lead **5** located more outward in the second direction y is longer than the second length L**2** of a second lead **5** located closer to the center in the second direction y. That is, in a comparison between the second lengths L**2** of two second leads **5** adjacent to each other, the second length L**2** of the second lead **5** located outward in the second direction y is longer than the second length L**2** of the second lead **5** located inward in the second direction y.

[0099] The present embodiment can also suppress excessive stress on the conductive bonding members used for mounting. The present embodiment can more effectively suppress excessive stress on the conductive bonding members by selecting the second lengths L**2** of the second leads **5** and the third lengths L**3** of the third leads **6** as described above.

Third Embodiment

[0100] FIG. **19** shows a semiconductor device according to a third embodiment of the present disclosure. In a semiconductor device A**3** of the present embodiment, the length of each of the first resin side surface **23** and the fourth resin side surface **26** in the first direction x is shorter than the length of each of the second resin side surface **24** and the third resin side surface **25** in the second direction y. In addition, the center lead **9** is disposed between the first leads **4** and the fourth leads **7** in the first direction x.

[0101] The present embodiment is similar to the above embodiments in that the first length L**1** of each of the first leads **4** located at opposite ends in the first direction x is longer than the first length L**1** of any of the rest of the first leads **4**, and that the fourth length L**4** of each of the fourth leads **7** located at opposite ends in the first direction x is longer than the fourth length L**4** of any of the rest of the fourth leads **7**. In other words, the semiconductor device A**3** is obtained by rotating the configuration similar to the semiconductor device A**1** by 90 degrees as viewed in the thickness direction z and redefining the names, the reference numerals, and so on.

[0102] The present embodiment can also suppress excessive stress on the conductive bonding members used for mounting. As can be understood from the present embodiment, when the sealing resin **2** is rectangular as viewed in the thickness direction z, the lengths of the leads located at opposite ends on the shorter sides, the longer sides, or both the shorter and longer sides of the rectangular sealing resin **2** can be made longer as appropriate.

Fourth Embodiment

[0103] FIG. **20** shows a semiconductor device according to a fourth embodiment of the present disclosure. A semiconductor device A**4** of the present embodiment is different from the above embodiments in the configuration of each corner lead **8**.

[0104] In the present embodiment, the corner mounting surface **83** of each corner lead **8** has a

pentagonal shape obtained by chamfering one corner of a rectangle. The dimension of the corner mounting surface **83** in the second direction y is smaller than each of the first lengths L**1** and the fourth lengths L**4**, and the dimension of the corner mounting surface **83** in the first direction x is smaller than each of the second lengths L**2** and the third lengths L**3**.

[0105] In the present embodiment, the second mounting surface **53** and the third mounting surface **63** closest to the y**1** side in the second direction y overlap with the first mounting surfaces **43** located at opposite ends in the first direction x as viewed in the first direction x. The second mounting surface **53** and the third mounting surface **63** closest to the y**2** side in the second direction y overlap with the fourth mounting surfaces **73** located at opposite ends in the first direction x as viewed in the first direction x.

[0106] The present embodiment can also suppress excessive stress on the conductive bonding members used for mounting. As can be understood from the present embodiment, the configuration of each corner lead **8** is not particularly limited and may be selected as appropriate. In another example, the semiconductor device of the present disclosure may not include the corner leads **8**.

[0107] The semiconductor device of the present disclosure is not limited to the first to fourth embodiments and the variations described above. FIGS. **21** to **23** show other variations and another embodiment of the present disclosure. In these figures, elements that are the same as or similar to those in the variation and embodiments described above are provided with the same reference numerals as in the variation and embodiments described above. The configurations of the elements in each variation and each embodiment can be combined as appropriate as long as the combination does not cause technical inconsistency.

Second Variation of the First Embodiment

[0108] FIG. **21** shows a second variation of the semiconductor device A**1**. A semiconductor device A**12** in the present variation is different from the example described above (see FIG. **14**) in the configuration of each corner lead **8**.

[0109] In the present variation, the length Lc**1** and the length Lc**2** of each corner mounting surface **83** are equal to each other. In this case, the sealing resin **2** may have a square shape as viewed in the thickness direction z.

[0110] The present variation can also suppress excessive stress on the conductive bonding members used for mounting. As can be understood from the present variation, the specific shape, etc., of each corner mounting surface **83** is not particularly limited.

Third Variation of the First Embodiment

[0111] FIG. **22** shows a third variation of the semiconductor device A**1**. A semiconductor device A**13** in the present variation is different from the examples described above in the configuration of each corner lead **8**.

[0112] In the present variation, each of the corner mounting surfaces **83** has a first portion **831**, a second portion **832**, and a third portion **833**. The third portion **833** is located between the second portion **832** and either the first resin side surface **23** or the fourth resin side surface **26** in the second direction y, and reaches the first portion **831** and either the second resin side surface **24** or the third resin side surface **25**. Since each corner mounting surface **83** has a first portion **831**, a second portion **832**, and a third portion **833**, the corner mounting surface **83** has an F-shape as viewed in the thickness direction z.

[0113] In the illustrated example, the third portion **833** is located between the second portion **832** and the first resin side surface **23** in the second direction y, and reaches the first portion **831** and the third resin side surface **25**. The array pitch between the second portion **832** and the third portion **833** may be the same as the array pitch P**2** or the array pitch P**3** in the above examples. The width of each of the second portion **832** and the third portion **833** in the second direction y may be the same as the width W**2** or the width W**3** in the above examples.

[0114] The present variation can also suppress excessive stress on the conductive bonding members used for mounting. As can be understood from the present variation, the specific shape, etc., of

each corner mounting surface **83** is not particularly limited as long as the corner mounting surfaces **83** are spaced apart from the four corners of the sealing resin **2**.

Fifth Embodiment

[0115] FIG. **23** shows a semiconductor device according to a fifth embodiment of the present disclosure. A semiconductor device A**5** of the present embodiment is different from the above embodiments in the configurations of the first leads **4** and the fourth leads **7**.

[0116] In the present embodiment, the first lengths L**1** of the first leads **4** are all equal. The lengths Lc**1** of the corner leads **8** are longer than the first lengths L**1** of the first leads **4**. Similarly, the fourth lengths L**4** of the fourth leads **7** are all equal. The lengths Lc**1** of the corner leads **8** are longer than the fourth lengths L**4** of the fourth leads **7**.

[0117] The present embodiment can also suppress excessive stress on the conductive bonding members used for mounting. As can be understood from the present embodiment, the relationships between the first lengths L**1** of the first leads **4**, the fourth lengths L**4** of the fourth leads **7**, the second lengths L**2** of the second leads **5**, and the third lengths L**3** of the third leads **6** are not limited in any way.

[0118] The semiconductor device of the present disclosure is not limited to the embodiments and the variations described above. Various design changes can be made to the specific configurations of the elements of the semiconductor device according to the present disclosure.

[0119] The present disclosure includes the embodiments described in the following clauses.

Clause 1A.

[0120] A semiconductor device comprising: [0121] a semiconductor element; [0122] a plurality of leads; and [0123] a sealing resin covering the semiconductor element and at least a part of each of the plurality of leads, [0124] wherein the sealing resin includes a resin reverse surface facing in a thickness direction of the semiconductor element, a first resin side surface along a first direction perpendicular to the thickness direction, and a second resin side surface and a third resin side surface along a second direction perpendicular to the thickness direction and the first direction, [0125] the plurality of leads include a plurality of first leads aligned in the first direction, [0126] each of the plurality of first leads includes a first mounting surface exposed from the resin reverse surface, [0127] the first mounting surface reaches the first resin side surface, and is spaced apart from the second resin side surface and the third resin side surface, and [0128] first lengths, which are lengths of the first mounting surfaces of the plurality of first leads in the second direction, are such that the first length of each of the first leads located at opposite ends in the first direction is longer than the first length of any of a rest of the first leads.

Clause 2A.

[0129] The semiconductor device according to clause 1A, wherein the first lengths of the plurality of first leads are such that the first length of a first lead located more outward in the first direction is longer than the first length of a first lead located closer to a center in the first direction.

Clause 3A.

[0130] The semiconductor device according to clause 1A or 2A, wherein the sealing resin has a rectangular shape as viewed in the thickness direction.

Clause 4A.

[0131] The semiconductor device according to any of clauses 1A to 3A, wherein each of the plurality of first leads includes a first end surface exposed from the first resin side surface.

Clause 5A.

[0132] The semiconductor device according to any of clauses 1A to 4A, wherein the first mounting surface has a shape that extends in the second direction.

Clause 6A.

[0133] The semiconductor device according to any of clauses 1A to 5A, wherein a length of the first resin side surface in the first direction is longer than a length of each of the second resin side surface and the third resin side surface in the second direction.

Clause 7A.
[0134] The semiconductor device according to any of clauses 1A to 5A, wherein a length of the first resin side surface in the first direction is shorter than a length of each of the second resin side surface and the third resin side surface in the second direction.
Clause 8A.
[0135] The semiconductor device according to any of clauses 1A to 5A, wherein a length of the first resin side surface in the first direction is equal to a length of each of the second resin side surface and the third resin side surface in the second direction.
Clause 9A.
[0136] The semiconductor device according to any of clauses 1A to 8A, wherein each of the first leads includes a first thick portion including the first mounting surface, and a first thin portion spaced apart from the resin reverse surface in the thickness direction.
Clause 10A.
[0137] The semiconductor device according to any of clauses 1A to 9A, wherein the sealing resin further includes a fourth resin side surface facing away from the first resin side surface in the second direction, and [0138] the plurality of leads further include a plurality of second leads aligned in the second direction along the second resin side surface, a plurality of third leads aligned in the second direction along the third resin side surface, and a plurality of fourth leads aligned in the first direction along the fourth resin side surface.
Clause 11A.
[0139] The semiconductor device according to clause 10A, wherein each of the plurality of second leads includes a second mounting surface exposed from the resin reverse surface, [0140] the second mounting surface reaches the second resin side surface, and is spaced apart from the first resin side surface and the fourth resin side surface, [0141] each of the plurality of third leads includes a third mounting surface exposed from the resin reverse surface, [0142] the third mounting surface reaches the third resin side surface, and is spaced apart from the first resin side surface and the fourth resin side surface, [0143] each of the plurality of fourth leads includes a fourth mounting surface exposed from the resin reverse surface, and [0144] the fourth mounting surface reaches the fourth resin side surface, and is spaced apart from the second resin side surface and the third resin side surface.
Clause 12A.
[0145] The semiconductor device according to clause 11A, fourth lengths, which are lengths of the fourth mounting surfaces of the plurality of fourth leads in the second direction, are such that the fourth length of each of the fourth leads located at opposite ends in the first direction is longer than the fourth length of any of a rest of the fourth leads.
Clause 13A.
[0146] The semiconductor device according to clause 12A, wherein the fourth lengths of the plurality of fourth leads are such that the fourth length of a fourth lead located more outward in the first direction is longer than the fourth length of a fourth lead located closer to a center in the first direction.
Clause 14A.
[0147] The semiconductor device according to any of clauses 11A to 13A, wherein second lengths, which are lengths of the second mounting surfaces of the plurality of second leads in the first direction, and third lengths, which are lengths of the third mounting surfaces of the plurality of third leads in the first direction, are shorter than the first lengths of the first leads located at opposite ends in the first direction.
Clause 15A.
[0148] The semiconductor device according to any of clauses 11A to 13A, wherein second lengths, which are lengths of the second mounting surfaces of the plurality of second leads in the first direction, are such that the second length of each of the second leads located at opposite ends in the

second direction is longer than the second length of any of a rest of the second leads, and [0149] third lengths, which are lengths of the third mounting surfaces of the plurality of third leads in the first direction, are such that the third length of each of the third leads located at opposite ends in the second direction is longer than the third length of any of a rest of the third leads.

Clause 16A.

[0150] The semiconductor device according to any of clauses 11A to 15A, wherein the plurality of leads further include a corner lead including a corner mounting surface that is located outside the first mounting surfaces of the plurality of first leads in the first direction, and that is exposed from the resin reverse surface, [0151] the corner mounting surface includes a first portion and a second portion, the first portion reaching the first resin side surface and being spaced apart from the second resin side surface and the third resin side surface, the second portion reaching the second resin side surface or the third resin side surface and being spaced apart from the first resin side surface and the fourth resin side surface, and the first portion and the second portion are connected to each other.

Clause 17A.

[0152] The semiconductor device according to clause 16A, wherein a length of the corner mounting surface in the second direction is longer than the first length of each of the first leads located at opposite ends in the first direction.

[0153] The present disclosure further includes the embodiments described in the following clauses.

Clause 1B.

[0154] A semiconductor device comprising: [0155] a semiconductor element; [0156] a plurality of leads; and [0157] a sealing resin covering the semiconductor element and at least a part of each of the plurality of leads, [0158] wherein the sealing resin includes a resin reverse surface facing in a thickness direction of the semiconductor element, a first resin side surface and a fourth resin side surface along a first direction perpendicular to the thickness direction, and a second resin side surface and a third resin side surface along a second direction perpendicular to the thickness direction and the first direction, [0159] the plurality of leads include a plurality of first leads, a plurality of fourth leads, and a corner lead, [0160] the plurality of first leads are aligned in the first direction along the first resin side surface, [0161] the plurality of fourth leads are aligned in the first direction along the fourth resin side surface, [0162] each of the plurality of first leads includes a first mounting surface exposed from the resin reverse surface, [0163] each of the plurality of fourth leads includes a fourth mounting surface exposed from the resin reverse surface, [0164] the corner lead includes a corner mounting surface that is located outside the first mounting surfaces of the plurality of first leads or the fourth mounting surfaces of the plurality of fourth leads in the first direction, and that is exposed from the resin reverse surface, [0165] the corner mounting surface includes a first portion and a second portion, the first portion reaching the first resin side surface or the fourth resin side surface and being spaced apart from the second resin side surface and the third resin side surface, the second portion reaching the second resin side surface or the third resin side surface and being spaced apart from the first resin side surface and the fourth resin side surface, and [0166] the first portion and the second portion are connected to each other.

Clause 2B.

[0167] The semiconductor device according to clause 1B, wherein the sealing resin has a rectangular shape as viewed in the thickness direction.

Clause 3B.

[0168] The semiconductor device according to clause 1B or 2B, wherein an array pitch between the first mounting surfaces of the plurality of first leads is equal to an array pitch between the first mounting surface of a first lead located outermost in the first direction out of the plurality of first leads and the first portion.

Clause 4B.

[0169] The semiconductor device according to any of clauses 1B to 3B, wherein a width of the first

mounting surface of each of the plurality of first leads in the first direction is equal to a width of the first portion in the first direction.
Clause 5B.
[0170] The semiconductor device according to any of clauses 1B to 4B, wherein a length of the corner mounting surface in the second direction is longer than a length of the first mounting surface of each of the plurality of first leads in the second direction.
Clause 6B.
[0171] The semiconductor device according to any of clauses 1B to 5B, wherein a length of the first portion in the second direction is longer than a length of the second portion in the first direction.
Clause 7B.
[0172] The semiconductor device according to any of clauses 1B to 5B, wherein a length of the first portion in the second direction is shorter than a length of the second portion in the first direction.
Clause 8B.
[0173] The semiconductor device according to any of clauses 1B to 5B, wherein a length of the first portion in the second direction is equal to a length of the second portion in the first direction.
Clause 9B.
[0174] The semiconductor device according to any of clauses 1B to 8B, wherein the corner lead includes a first corner end surface exposed from the first resin side surface, and a second corner end surface exposed from the second resin side surface or the third resin side surface.
Clause 10B.
[0175] The semiconductor device according to any of clauses 1B to 9B, wherein a length of the first resin side surface in the first direction is longer than a length of each of the second resin side surface and the third resin side surface in the second direction.
Clause 11B.
[0176] The semiconductor device according to any of clauses 1B to 9B, wherein a length of the first resin side surface in the first direction is shorter than a length of each of the second resin side surface and the third resin side surface in the second direction.
Clause 12B.
[0177] The semiconductor device according to any of clauses 1B to 9B, wherein a length of the first resin side surface in the first direction is equal to a length of each of the second resin side surface and the third resin side surface in the second direction.
Clause 13B.
[0178] The semiconductor device according to any of clauses 1B to 12B, wherein the corner lead includes a corner thick portion including the corner mounting surface, and a corner thin portion spaced apart from the resin reverse surface in the thickness direction.
Clause 14B.
[0179] The semiconductor device according to any of clauses 1B to 13B, wherein the plurality of leads further include a plurality of second leads aligned in the second direction along the second resin side surface, a plurality of third leads aligned in the second direction along the third resin side surface, and a plurality of fourth leads aligned in the first direction along the fourth resin side surface.
Clause 15B.
[0180] The semiconductor device according to clause 14B, wherein each of the plurality of second leads includes a second mounting surface exposed from the resin reverse surface, [0181] the second mounting surface reaches the second resin side surface, and is spaced apart from the first resin side surface and the fourth resin side surface, [0182] each of the plurality of third leads includes a third mounting surface exposed from the resin reverse surface, [0183] the third mounting surface reaches the third resin side surface, and is spaced apart from the first resin side surface and the fourth resin

side surface, and [0184] the fourth mounting surface reaches the fourth resin side surface, and is spaced apart from the second resin side surface and the third resin side surface.
Clause 16B.
[0185] The semiconductor device according to clause 15B, wherein an array pitch between the second mounting surfaces of the plurality of second leads is equal to an array pitch between the second mounting surface of a second lead located outermost in the second direction out of the plurality of second leads and the second portion.
Clause 17B.
[0186] The semiconductor device according to clause 15B or 16B, wherein a width of the second mounting surface of each of the plurality of second leads in the second direction is equal to a width of the second portion in the second direction.
REFERENCE NUMERALS
[0187] A**1**, A**11**, A**12**, A**13**, A**2**, A**3**, A**4**, A**5**: Semiconductor device [0188] **1**: Semiconductor element [0189] **2**: Sealing resin [0190] **4**: First lead [0191] **5**: Second lead [0192] **6**: Third lead [0193] **7**: Fourth lead [0194] **8**: Corner lead [0195] **9**: Center lead [0196] **21**: Resin obverse surface [0197] **22**: Resin reverse surface [0198] **23**: First resin side surface [0199] **24**: Second resin side surface [0200] **25**: Third resin side surface [0201] **26**: Fourth resin side surface [0202] **41**: First thick portion [0203] **42**: First thin portion [0204] **43**: First mounting surface [0205] **44**: First end surface [0206] **51**: Second thick portion [0207] **52**: Second thin portion [0208] **53**: Second mounting surface [0209] **54**: Second end surface [0210] **61**: Third thick portion [0211] **62**: Third thin portion [0212] **63**: Third mounting surface [0213] **64**: Third end surface [0214] **71**: Fourth thick portion [0215] **72**: Fourth thin portion [0216] **73**: Fourth mounting surface [0217] **74**: Fourth end surface [0218] **81**: Corner thick portion [0219] **82**: Corner thin portion [0220] **83**: Corner mounting surface [0221] **831**: First portion [0222] **832**: Second portion [0223] **833**: Third portion [0224] **841**: First corner end surface [0225] **842**: Second corner end surface [0226] **911**, **912**, **913**: Center thick portion [0227] **921**, **922**: Center thin portion [0228] **931**, **932**, **933**: Center mounting surface [0229] **941**, **942**: Center end surface [0230] P**1**, P**2**, P**3**, P**4**, Pc**1**, Pc**2**, Pc**3**, Pc**4**: Array pitch [0231] x: First direction [0232] y: Second direction [0233] z: Thickness direction

Claims

1. A semiconductor device comprising: a semiconductor element; a plurality of leads; and a sealing resin covering the semiconductor element and at least a part of each of the plurality of leads, wherein the sealing resin includes a resin reverse surface facing in a thickness direction of the semiconductor element, a first resin side surface along a first direction perpendicular to the thickness direction, and a second resin side surface and a third resin side surface along a second direction perpendicular to the thickness direction and the first direction, the plurality of leads include a plurality of first leads aligned in the first direction, each of the plurality of first leads includes a first mounting surface exposed from the resin reverse surface, the first mounting surface reaches the first resin side surface, and is spaced apart from the second resin side surface and the third resin side surface, and first lengths, which are lengths of the first mounting surfaces of the plurality of first leads in the second direction, are such that the first length of each of the first leads located at opposite ends in the first direction is longer than the first length of any of a rest of the first leads.
2. The semiconductor device according to claim 1, wherein the first lengths of the plurality of first leads are such that the first length of a first lead located more outward in the first direction is longer than the first length of a first lead located closer to a center in the first direction.
3. The semiconductor device according to claim 1, wherein the sealing resin has a rectangular shape as viewed in the thickness direction.
4. The semiconductor device according to claim 1, wherein each of the plurality of first leads

includes a first end surface exposed from the first resin side surface.

5. The semiconductor device according to claim 1, wherein the first mounting surface has a shape that extends in the second direction.

6. The semiconductor device according to claim 1, wherein a length of the first resin side surface in the first direction is longer than a length of each of the second resin side surface and the third resin side surface in the second direction.

7. The semiconductor device according to claim 1, wherein a length of the first resin side surface in the first direction is shorter than a length of each of the second resin side surface and the third resin side surface in the second direction.

8. The semiconductor device according to claim 1, wherein a length of the first resin side surface in the first direction is equal to a length of each of the second resin side surface and the third resin side surface in the second direction.

9. The semiconductor device according to claim 1, wherein each of the first leads includes a first thick portion including the first mounting surface, and a first thin portion spaced apart from the resin reverse surface in the thickness direction.

10. The semiconductor device according to claim 1, wherein the sealing resin further includes a fourth resin side surface facing away from the first resin side surface in the second direction, and the plurality of leads further include a plurality of second leads aligned in the second direction along the second resin side surface, a plurality of third leads aligned in the second direction along the third resin side surface, and a plurality of fourth leads aligned in the first direction along the fourth resin side surface.

11. The semiconductor device according to claim 10, wherein each of the plurality of second leads includes a second mounting surface exposed from the resin reverse surface, the second mounting surface reaches the second resin side surface, and is spaced apart from the first resin side surface and the fourth resin side surface, each of the plurality of third leads includes a third mounting surface exposed from the resin reverse surface, the third mounting surface reaches the third resin side surface, and is spaced apart from the first resin side surface and the fourth resin side surface, each of the plurality of fourth leads includes a fourth mounting surface exposed from the resin reverse surface, and the fourth mounting surface reaches the fourth resin side surface, and is spaced apart from the second resin side surface and the third resin side surface.

12. The semiconductor device according to claim 11, fourth lengths, which are lengths of the fourth mounting surfaces of the plurality of fourth leads in the second direction, are such that the fourth length of each of the fourth leads located at opposite ends in the first direction is longer than the fourth length of any of a rest of the fourth leads.

13. The semiconductor device according to claim 12, wherein the fourth lengths of the plurality of fourth leads are such that the fourth length of a fourth lead located more outward in the first direction is longer than the fourth length of a fourth lead located closer to a center in the first direction.

14. The semiconductor device according to claim 11, wherein second lengths, which are lengths of the second mounting surfaces of the plurality of second leads in the first direction, and third lengths, which are lengths of the third mounting surfaces of the plurality of third leads in the first direction, are shorter than the first lengths of the first leads located at opposite ends in the first direction.

15. The semiconductor device according to claim 11, wherein second lengths, which are lengths of the second mounting surfaces of the plurality of second leads in the first direction, are such that the second length of each of the second leads located at opposite ends in the second direction is longer than the second length of any of a rest of the second leads, and third lengths, which are lengths of the third mounting surfaces of the plurality of third leads in the first direction, are such that the third length of each of the third leads located at opposite ends in the second direction is longer than the third length of any of a rest of the third leads.

16. The semiconductor device according to claim 11, wherein the plurality of leads further include a corner lead including a corner mounting surface that is located outside the first mounting surfaces of the plurality of first leads in the first direction, and that is exposed from the resin reverse surface, the corner mounting surface includes a first portion and a second portion, the first portion reaching the first resin side surface and being spaced apart from the second resin side surface and the third resin side surface, the second portion reaching the second resin side surface or the third resin side surface and being spaced apart from the first resin side surface and the fourth resin side surface, and the first portion and the second portion are connected to each other.

17. The semiconductor device according to claim 16, wherein a length of the corner mounting surface in the second direction is longer than the first length of each of the first leads located at opposite ends in the first direction.