DESCRIPTION

Title of Invention

MEASUREMENT METHOD AND MEASUREMENT DEVICE

Technical Field

[0001] One aspect of the present disclosure relates to a measurement method and a measurement device for observing an electrical response of a semiconductor device caused by irradiating the semiconductor device with a light beam.

Background Art

[0002] For example, Patent Literature 1 describes an inspection method for a semiconductor device that performs observation by detecting a change in current appearing in the semiconductor device upon irradiation with an infrared beam. Patent Literature 2 describes a non-destructive inspection method that detects the intensity of a magnetic field induced by a thermoelectromotive current generated in a semiconductor device chip by irradiation with a laser beam, and inspects the presence or absence of a defect in the semiconductor device chip based on the detection result.

Citation List

Patent Literature

[0003] [Patent Literature 1] Japanese Unexamined Patent Publication No. H11-316266

[Patent Literature 2] Japanese Unexamined Patent Publication No. 2000-286314

Summary of Invention

Technical Problem

[0004] During an inspection such as those described above, a semiconductor device and a measurement instrument are electrically connected to each other by wiring in order to detect an electrical signal. Since the electrical response generated in the semiconductor device is weak, if noise (current noise) is included in the current flowing through the wiring, there is a concern that an erroneous determination may be made. In particular, in recent years, miniaturization of semiconductor devices has been advancing. In a miniaturized semiconductor device, the current to be measured is smal, so that the influence of current noise becomes significant.

[0005] Accordingly, an object of one aspect of the present disclosure is to provide a measurement method and a measurement device capable of reducing current noise.

Solution to Problem

[0006] A measurement method according to one aspect of the present disclosure is [1] “a measurement method including: a preparation step of electrically connecting a first wiring and a second wiring to a semiconductor device; and a measurement step of measuring, by a measurement instrument, a measurement value corresponding to a current flowing through the first wiring and the second wiring while irradiating the semiconductor device with a light beam, in order to observe an electrical response of the semiconductor device caused by irradiating the semiconductor device with the light beam, wherein in the preparation step, the first wiring and the second wiring are arranged such that the first wiring and the second wiring form at least two loop portions

in which directions of current flow are opposite to each other when viewed from a predetermined direction, and in the measurement step, the measurement value is measured in a state in which the two loop portions are formed."

[0007] The present inventors have found the following findings. That is, when measurement is performed by electrically connecting a semiconductor device and a measurement instrument by two wirings, a loop-shaped current path (loop portion) is formed by the two wirings. In a measurement device for performing such measurement, a magnetic field inside the measurement device can change due to, for example, the influence of various devices. When the magnetic field acting on the loop portion changes due to such a change in the magnetic field, an induced current is generated in the loop portion by electromagnetic induction. This induced current can become current noise. Although this induced current is weak, when the electrical response of the semiconductor device to be observed is also weak, it can become a cause of erroneous determination. Based on this finding, in this measurement method, the measurement value corresponding to the current flowing through the first wiring and the second wiring is measured in a state in which two loop portions, in which the directions of current flow are opposite to each other when viewed from a predetermined direction, are formed by the first wiring and the second wiring. As a result, when the magnetic field acting on the two loop portions changes, the induced current generated in one of the two loop portions cancels out the induced current generated in the other of the two loop portions. As a result, current noise caused by electromagnetic induction can be reduced. As described above,

according to this measurement method, current noise can be reduced.

[0008] A measurement method according to one aspect of the present disclosure may be [2] “the measurement method according to [1], wherein in the preparation step, the arrangement of the first wiring and the second wiring is adjusted such that, when the magnetic field acting on the two loop portions changes, the induced current generated in one of the two loop portions cancels out the induced current generated in the other of the two loop portions.” In this case, the induced currents generated in the two loop portions can be reliably caused to cancel each other out.

[0009] A measurement method according to one aspect of the present disclosure may be [3] “the measurement method according to [1] or [2], wherein in the preparation step, a loop area of at least one of the two loop portions when viewed from the predetermined direction is adjusted such that, when the magnetic field acting on the two loop portions changes, the induced current generated in one of the two loop portions cancels out the induced current generated in the other of the two loop portions.” In this case, the induced currents generated in the two loop portions can be reliably caused to cancel each other out.

[0010] A measurement method according to one aspect of the present disclosure may be [4] “the measurement method according to any one of [1] to [3], wherein in the preparation step, an angle of a plane on which the loop portion is arranged is adjusted for at least one of the two loop portions such that, when the magnetic field acting on the two loop portions changes, the induced current generated in one of the two loop portions cancels out the induced current generated in the other of the two

loop portions." In this case, the induced currents generated in the two loop portions can be reliably caused to cancel each other out.

[0011] A measurement method according to one aspect of the present disclosure may be [5] "the measurement method according to any one of [1] to [4], wherein in the preparation step, an even number of the loop portions are formed." In this case, the induced currents generated in the loop portions can be easily caused to cancel each other out as compared with a case where an odd number of loop portions are formed.

[0012] A measurement method according to one aspect of the present disclosure may be [6] "the measurement method according to any one of [1] to [5], wherein in the preparation step, the two loop portions are formed so as to be located on the same plane." In this case, the induced currents generated in the two loop portions can be easily caused to cancel each other out.

[0013] A measurement method according to one aspect of the present disclosure may be [7] "the measurement method according to any one of [1] to [6], wherein each of the first wiring and the second wiring is constituted by a coaxial cable including an inner conductor and an outer conductor disposed outside the inner conductor, and in the preparation step, for each of the first wiring and the second wiring, the inner conductor of the coaxial cable is electrically connected to the semiconductor device, and the outer conductor of the coaxial cable is electrically connected to ground." In this case, since the outer conductors of the coaxial cables constituting the first wiring and the second wiring are electrically connected to the ground, electrostatic noise generated in the first wiring and the second wiring can be reduced.

[0014] A measurement method according to one aspect of the present disclosure may be [8] “the measurement method according to [7], wherein in the preparation step, the first wiring and the second wiring are connected to a triaxial cable including an inner conductor, an outer conductor disposed outside the inner conductor, and an intermediate conductor disposed between the inner conductor and the outer conductor, the inner conductor of the coaxial cable constituting one of the first wiring and the second wiring is electrically connected to the inner conductor of the triaxial cable, the inner conductor of the coaxial cable constituting the other of the first wiring and the second wiring is electrically connected to the intermediate conductor of the triaxial cable, and for each of the first wiring and the second wiring, the outer conductor of the coaxial cable is electrically connected to the outer conductor of the triaxial cable.” In this case, the outer conductors of the coaxial cables constituting the first wiring and the second wiring can be electrically connected to the ground using the triaxial cable.

[0015] A measurement method according to one aspect of the present disclosure may be [9] “the measurement method according to any one of [1] to [6], wherein each of the first wiring and the second wiring is constituted by a cable including a first conductor and a second conductor, and in the preparation step, for each of the first wiring and the second wiring, one end portion of the first conductor is electrically connected to the semiconductor device, one end portion of the second conductor of the cable constituting the first wiring and one end portion of the second conductor of the cable constituting the second wiring are electrically connected to each other, and for each of the first wiring and the second

wiring, the other end portion of the second conductor is electrically connected to ground." In this case, since the second conductors of the cables constituting the first wiring and the second wiring are electrically connected to the ground, electrostatic noise generated in the first wiring and the second wiring can be reduced. In addition, since the one end portion of the second conductor of the cable constituting the first wiring and the one end portion of the second conductor of the cable constituting the second wiring are electrically connected to each other, current noise caused by electromagnetic induction can be reduced as compared with a case where they are not electrically connected to each other. That is, by connecting the one end portions of the second conductors of the cables constituting the first wiring and the second wiring to each other, it is possible to form a closed circuit connected to the ground with respect to the second conductors, and as a result, current noise caused by electromagnetic induction can be reduced.

[0016] A measurement method according to one aspect of the present disclosure may be [10] "the measurement method according to [9], wherein the cable is a coaxial cable including an inner conductor and an outer conductor disposed outside the inner conductor, the first conductor is the inner conductor, and the second conductor is the outer conductor." Alternatively, a measurement method according to one aspect of the present disclosure may be [11] "the measurement method according to [9], wherein the cable is a twist cable in which at least two wirings are twisted together, the first conductor is one of the two wirings, and the second conductor is the other of the two wirings."

[0017] A measurement method according to one aspect of the present

disclosure may be [12] “the measurement method according to any one of [1] to [11], wherein in the preparation step, the two loop portions are formed by using a jig including a first portion and a second portion extending so as to intersect the first portion, arranging the first wiring on the first portion along the first portion, and arranging the second wiring on the second portion along the second portion.” In this case, since the two loop portions can be formed by arranging the first wiring and the second wiring on the jig, the work of arranging the first wiring and the second wiring can be facilitated.

[0018] A measurement method according to one aspect of the present disclosure may be [13] “the measurement method according to [12], wherein the first portion and the second portion are connected to each other so as to be relatively rotatable and/or slidably movable.” In this case, the shape of the two loop portions can be adjusted by relatively rotating the first portion and the second portion. In addition, the loop areas of the two loop portions can be adjusted by relatively sliding the first portion and the second portion.

[0019] A measurement device according to one aspect of the present disclosure is [14] “a measurement device for observing an electrical response of a semiconductor device caused by irradiating the semiconductor device with a light beam, the measurement device including: a light source that outputs the light beam; a first wiring and a second wiring electrically connected to the semiconductor device; a measurement instrument electrically connected to the first wiring and the second wiring, and configured to measure a measurement value corresponding to a current flowing through the first wiring and the

second wiring during the observation; and a jig including a first portion and a second portion extending so as to intersect the first portion, the jig being configured such that, when the first wiring is arranged on the first portion along the first portion and the second wiring is arranged on the second portion along the second portion, at least two loop portions in which directions of current flow are opposite to each other when viewed from a predetermined direction are formed by the first wiring and the second wiring."

[0020] When this measurement device is used, the first wiring is arranged on the first portion of the jig along the first portion, and the second wiring is arranged on the second portion of the jig along the second portion, and a measurement value corresponding to the current flowing through the first wiring and the second wiring can be measured in a state in which two loop portions, in which the directions of current flow are opposite to each other when viewed from a predetermined direction, are formed by the first wiring and the second wiring. As a result, when the magnetic field commonly acting on the two loop portions changes, the induced current generated in one of the two loop portions cancels out the induced current generated in the other of the two loop portions. Therefore, current noise caused by electromagnetic induction is reduced. Thus, according to this measurement device, current noise can be reduced. In addition, since the two loop portions can be formed by arranging the first wiring and the second wiring on the jig, the work of arranging the first wiring and the second wiring can also be facilitated.

[0021] A measurement device according to one aspect of the present

disclosure may be [15] “the measurement device according to [14], wherein the first portion and the second portion are connected to each other so as to be relatively rotatable and/or slidably movable.” In this case, the shape of the two loop portions can be adjusted by relatively rotating the first portion and the second portion. In addition, the loop areas of the two loop portions can be adjusted by relatively sliding the first portion and the second portion.

[0022] A measurement method according to one aspect of the present disclosure may be [16] “a measurement method including: a preparation step of electrically connecting a first wiring and a second wiring to a semiconductor device; and a measurement step of measuring, by a measurement instrument, a measurement value corresponding to a current flowing through the first wiring and the second wiring while irradiating the semiconductor device with a light beam, in order to observe an electrical response of the semiconductor device caused by irradiating the semiconductor device with the light beam, wherein each of the first wiring and the second wiring is constituted by a cable including a first conductor and a second conductor, and in the preparation step, for each of the first wiring and the second wiring, one end portion of the first conductor is electrically connected to the semiconductor device, one end portion of the second conductor of the cable constituting the first wiring and one end portion of the second conductor of the cable constituting the second wiring are electrically connected to each other, and for each of the first wiring and the second wiring, the other end portion of the second conductor is electrically connected to ground.” In this case, since the second conductors of the

cables constituting the first wiring and the second wiring are electrically connected to the ground, electrostatic noise generated in the first wiring and the second wiring can be reduced. In addition, since the one end portion of the second conductor of the cable constituting the first wiring and the one end portion of the second conductor of the cable constituting the second wiring are electrically connected to each other, current noise caused by electromagnetic induction can be reduced as compared with a case where they are not electrically connected to each other. That is, by connecting the one end portions of the second conductors of the cables constituting the first wiring and the second wiring to each other, it is possible to form a closed circuit connected to the ground with respect to the second conductors, and as a result, current noise caused by electromagnetic induction can be reduced.

[0023] A measurement method according to one aspect of the present disclosure may be [17] “the measurement method according to [16], wherein the cable is a coaxial cable including an inner conductor and an outer conductor disposed outside the inner conductor, the first conductor is the inner conductor, and the second conductor is the outer conductor.” Alternatively, a measurement method according to one aspect of the present disclosure may be [18] “the measurement method according to [16], wherein the cable is a twist cable in which at least two wirings are twisted together, the first conductor is one of the two wirings, and the second conductor is the other of the two wirings.”

[0024] A measurement method according to one aspect of the present disclosure may be [19] “the measurement method according to any one of [16] to [18], wherein in the preparation step, the first wiring and the

second wiring are connected to a triaxial cable including an inner conductor, an outer conductor disposed outside the inner conductor, and an intermediate conductor disposed between the inner conductor and the outer conductor, the other end portion of the first conductor of the first wiring is electrically connected to the inner conductor of the triaxial cable, the other end portion of the first conductor of the second wiring is electrically connected to the intermediate conductor of the triaxial cable, and for each of the first wiring and the second wiring, the other end portion of the second conductor is electrically connected to the outer conductor of the triaxial cable." In this case, the second conductors of the first wiring and the second wiring can be electrically connected to the ground using the triaxial cable.

Advantageous Effects of Invention

[0025] According to one aspect of the present disclosure, it is possible to provide a measurement method and a measurement device capable of reducing current noise.

Brief Description of Drawings

[0026] FIG. 1 is a configuration diagram of a measurement device according to an embodiment.

FIG. 2 is a diagram for explaining a wiring portion during measurement.

FIG. 3 is a diagram for explaining a wiring portion of a first modification.

FIG. 4 is a diagram for explaining a wiring portion of a second modification.

FIG. 5 is a diagram for explaining a wiring portion of a third

modification.

FIG. 6 is a diagram for explaining a wiring portion of a fourth modification.

FIG. 7 is a diagram for explaining a wiring portion of a fifth modification.

FIG. 8 is a diagram for explaining a wiring portion of a sixth modification.

FIG. 9 is a configuration diagram of a wiring portion of a seventh modification.

FIG. 10 is a diagram for explaining a jig of an eighth modification.

Description of Embodiments

[0027] Hereinafter, an embodiment of the present disclosure will be described in detail with reference to the drawings. In the following description, the same reference signs are used for the same or equivalent elements, and repeated descriptions will be omitted.

[0028] As illustrated in FIG. 1, a measurement device 1 includes a light source 2, a scan optical system 3, a power supply 4, a measurement instrument 5, a computer 6, an input device 7, a display device 8, and a wiring portion 10. The measurement device 1 is a measurement device for observing an electrical response of a semiconductor device S caused by irradiating the semiconductor device S with a light beam L. The measurement device 1 includes a housing (not illustrated), and each component constituting the measurement device 1 is disposed in the housing.

[0029] The measurement device 1 is used, for example, in

semiconductor failure analysis for identifying a failure location in the semiconductor device S to be inspected. That is, the measurement device 1 can also be regarded as a semiconductor failure analysis device (failure location identification device). The semiconductor failure analysis performed by the measurement device 1 may be, for example, OBIRCH (Optical Beam Induced Resistive Change) analysis for observing a change in electrical resistance caused by a change in temperature at a specific position in the semiconductor device S due to heat generated by irradiation with the light beam L. Alternatively, the semiconductor failure analysis performed by the measurement device 1 may be OBIC (Optical Beam Induced Current) analysis, SDL (Soft Defect Localization) analysis, LADA (Laser Assisted Device Alteration) analysis, thermoelectromotive current analysis, or the like, for observing a current (photocurrent) generated in the semiconductor device S by irradiation with the light beam L.

[0030] The light source 2 generates and outputs the light beam L. The light source 2 is, for example, a laser generator such as a laser diode, a superluminescent diode, a light-emitting diode, or the like. The light beam L may be coherent light such as laser light, or may be incoherent light. For example, in the case of OBIRCH analysis or thermoelectromotive current analysis, a light source 2 that outputs a light beam L having a center wavelength of 1200 nm or more (for example, 1300 nm) can be used. In the case of OBIC analysis, a light source 2 that outputs a light beam L having a center wavelength of 1200 nm or less (for example, 1152 nm) is used. Note that a light source 2 that outputs a light beam L having a center wavelength of 1200 nm or less

may also be used in OBIRCH analysis.

[0031] The scan optical system 3 is an optical system for condensing the light beam L output from the light source 2 on or inside the semiconductor device S and scanning the condensing position. The scan optical system 3 includes, for example, an optical scanner such as a galvano scanner, a MEMS (Micro Electro Mechanical Systems) scanner, a polygon mirror, or a digital mirror device, and an objective lens and the like.

[0032] The power supply 4 supplies driving power to the semiconductor device S, for example, during OBIRCH analysis. The power supply 4 may be, for example, a constant voltage source that applies a constant voltage to the semiconductor device S, or may be a constant current source that applies a constant current to the semiconductor device S.

[0033] The measurement instrument 5 measures a measurement value for failure analysis. Specifically, the measurement instrument 5 is electrically connected to the semiconductor device S via a wiring portion 10 having a first wiring 11 and a second wiring 12 described later, and measures a measurement value corresponding to a current flowing through the first wiring 11 and the second wiring 12 during observation. In the case of OBIRCH analysis, the measurement instrument 5 measures a change in current or voltage accompanying a change in electrical resistance generated in the semiconductor device S by irradiation with the light beam L. In the case of OBIC analysis or thermoelectromotive current analysis, the measurement instrument 5 measures a photocurrent (OBIC current) or a thermoelectromotive current generated in the semiconductor device S by irradiation with the

light beam L. The measurement instrument 5 may measure a current, a voltage, or a resistance as a measurement value, or may measure the intensity of a magnetic field induced by a current generated in the semiconductor device S.

[0034] The computer 6 includes, for example, a processor such as a CPU and a storage medium such as a RAM or a ROM. The computer 6 is communicably connected to the light source 2, the scan optical system 3, the power supply 4, and the measurement instrument 5. The computer 6 functions as a control unit 61 and an image generation unit 62. The control unit 61 controls each component of the measurement device 1, such as the light source 2, the scan optical system 3, the power supply 4, and the measurement instrument 5. The image generation unit 62 generates, as a result image, a measurement result at each irradiation position (x, y) of the light beam L on the semiconductor device S based on the measurement result of the measurement instrument 5 acquired while scanning the condensing position by the scan optical system 3. Connected to the computer 6 are an input device 63 for inputting information to the computer 6 and a display device 64 for displaying various information including, for example, the result image.

[0035] The wiring portion 10 is used to electrically connect the measurement instrument 5 and the semiconductor device S. The wiring portion 10 has a first wiring 11, a second wiring 12, and a trunk wiring 13. In the wiring portion 10, the first wiring 11 and the second wiring 12 are connected to the trunk wiring 13, and the first wiring 11 and the second wiring 12 branch from the trunk wiring 13 and extend. The trunk wiring 13 is connected to the measurement instrument 5, and the first

wiring 11 and the second wiring 12 are connected to the semiconductor device S. As a result, the measurement instrument 5 is electrically connected to the semiconductor device S via the wiring portion 10.

[0036] In this example, the trunk wiring 13 is constituted by a coaxial cable 14. The coaxial cable 14 has an inner conductor 14a and an outer conductor 14b disposed outside the inner conductor 14a. A coaxial cable includes, for example, an inner conductor composed of a metal wire constituting a core material, a tubular insulating layer surrounding the inner conductor, an outer conductor composed of, for example, a tubular metal braid surrounding the insulating layer, and a tubular insulator (sheath) surrounding the outer conductor. For example, the inner conductor 14a is constituted by the metal wire, and the outer conductor 14b is constituted by the metal braid.

[0037] Each of the first wiring 11 and the second wiring 12 is constituted by a cable in which a conductor composed of, for example, a metal wire is surrounded by a tubular insulator. One end 11a of the first wiring 11 is provided with a first pin P1 that contacts and is electrically connected to a pad portion S1 of the semiconductor device S during measurement. The other end 11b of the first wiring 11 is electrically connected to the inner conductor 14a of the coaxial cable 14. One end 12a of the second wiring 12 is provided with a second pin P2 that contacts and is electrically connected to a pad portion S2 of the semiconductor device S during measurement. The other end 12b of the second wiring 12 is electrically connected to the outer conductor 14b of the coaxial cable 14. The inner conductor 14a and the outer conductor 14b of the coaxial cable 14 are electrically connected to the measurement instrument 5, and the

other end 11b of the first wiring 11 and the other end 12b of the second wiring 12 are electrically connected to the measurement instrument 5 via the coaxial cable 14.

[0038] As illustrated in FIG. 2, in the measurement device 1, the measurement value is measured by the measurement instrument 5 in a state in which the first wiring 11 and the second wiring 12 are arranged so as to cross each other at an intersection point A, and a first loop portion LP1 and a second loop portion LP2 (two loop-shaped current paths) are formed. The first loop portion LP1 and the second loop portion LP2 are formed close to each other so as to face each other with the intersection point A therebetween. When viewed from a predetermined direction D (a direction perpendicular to the plane on which the first wiring 11 and the second wiring 12 are arranged during measurement) (a direction perpendicular to the plane of the paper in FIG. 2), the directions of the current flowing through the first loop portion LP1 and the second loop portion LP2 are opposite to each other. That is, in the example of FIG. 2, current flows counterclockwise through the first loop portion LP1, and current flows clockwise through the second loop portion LP2. In FIG. 2, the directions of the current flowing through the first loop portion LP1 and the second loop portion LP2 are indicated by arrows along the first loop portion LP1 and the second loop portion LP2. In addition, the direction of the current flowing through the semiconductor device S is indicated by an arrow on the semiconductor device S. A part of the first loop portion LP1 can also be regarded as being constituted by the semiconductor device S. Note that in FIG. 2, the arrangement of each component is schematically illustrated, the predetermined direction D

may be, for example, a vertical direction, and the semiconductor device S may be arranged such that the main surface on which the pad portions S1 and S2 are formed is along the horizontal direction.

[0039] The first wiring 11 and the second wiring 12 (the first loop portion LP1 and the second loop portion LP2) are arranged, for example, on an arrangement table having a flat arrangement surface. As a result, the first loop portion LP1 and the second loop portion LP2 are located on the same plane. The first wiring 11 and the second wiring 12 may or may not be fixed to the arrangement surface. The first wiring 11 and the second wiring 12 may be in contact with each other at the intersection point A, or may be separated from each other at the intersection point A. The loop areas of the first loop portion LP1 and the second loop portion LP2 when viewed from the predetermined direction D (the areas of the regions surrounded by the loop portions) are, for example, approximately equal to each other.

[0040] In the housing of the measurement device 1, the magnetic field generated inside the housing can change due to, for example, the influence of various devices. FIG. 2 illustrates a change M in the magnetic field generated inside the housing. When the first loop portion LP1 and the second loop portion LP2 having approximately equal loop areas are formed close to each other on the same plane as in FIG. 2, and a change M in the magnetic field occurs inside the housing, the amounts and directions of the change M in the magnetic field acting on the first loop portion LP1 and the second loop portion LP2 are approximately equal to each other. Therefore, the induced currents generated by electromagnetic induction in the first loop portion LP1 and the second

loop portion LP2 are also approximately equal to each other. FIG. 2 illustrates induced currents IC generated in the first loop portion LP1 and the second loop portion LP2. The induced currents IC generated in the first loop portion LP1 and the second loop portion LP2 are in the same direction (counterclockwise in this example). Since the induced currents IC in the same direction are generated in the first loop portion LP1 and the second loop portion LP2, the induced current IC generated in one of the first loop portion LP1 and the second loop portion LP2 cancels out the induced current IC generated in the other. In this manner, in the measurement device 1, the currents generated by electromagnetic induction in the first loop portion LP1 and the second loop portion LP2 can be canceled out, and as a result, current noise caused by electromagnetic induction can be reduced. Note that the changes M in the magnetic field acting on the first loop portion LP1 and the second loop portion LP2 may be different from each other. In this case, the magnitudes of the induced currents IC generated in the first loop portion LP1 and the second loop portion LP2 are also different from each other.

[0041] A measurement method using the measurement device 1 will be described. This measurement method includes a preparation step and a measurement step in this order. In the preparation step, the first wiring 11 and the second wiring 12 are electrically connected to the semiconductor device S. More specifically, the first pin P1 provided at the one end 11a of the first wiring 11 is electrically connected to the pad portion S1 of the semiconductor device S, and the second pin P2 provided at the one end 12a of the second wiring 12 is electrically connected to the pad portion S2 of the semiconductor device S.

[0042] In the preparation step, the first wiring 11 and the second wiring 12 are arranged such that the first wiring 11 and the second wiring 12 form the first loop portion LP1 and the second loop portion LP2. At this time, as described above, the first wiring 11 and the second wiring 12 are arranged on the arrangement surface of the arrangement table, and the first loop portion LP1 and the second loop portion LP2 are formed so as to be located on the same plane.

[0043] In the preparation step, the arrangement of the first wiring 11 and the second wiring 12 may be adjusted such that, when the magnetic field M acting on the first loop portion LP1 and the second loop portion LP2 changes, the induced current IC generated in one of the first loop portion LP1 and the second loop portion LP2 cancels out the induced current IC generated in the other (adjustment step).

[0044] In the adjustment step, the loop area of at least one of the first loop portion LP1 and the second loop portion LP2 may be adjusted such that, when the magnetic field M acting on the first loop portion LP1 and the second loop portion LP2 changes, the induced current IC generated in one of the first loop portion LP1 and the second loop portion LP2 cancels out the induced current IC generated in the other (area adjustment step). For example, the loop area of one of the first loop portion LP1 and the second loop portion LP2 may be adjusted such that the loop areas of the first loop portion LP1 and the second loop portion LP2 are approximately equal to each other. Note that, in order to cause the induced currents IC to cancel each other out, it may be preferable to make the loop areas of the first loop portion LP1 and the second loop portion LP2 coincide with each other, but current noise can be reduced

even if they do not completely coincide with each other. In the adjustment step, the adjustment may be made such that the induced currents IC generated in the first loop portion LP1 and the second loop portion LP2 completely cancel each other out, or the adjustment may be made such that the induced currents IC generated in the first loop portion LP1 and the second loop portion LP2 partially cancel each other out. That is, in the adjustment step, the arrangement of the first wiring 11 and the second wiring 12 may be adjusted such that the degree to which the induced currents IC generated in the first loop portion LP1 and the second loop portion LP2 cancel each other out becomes larger.

[0045] In the adjustment step, the angle of the plane on which the loop portion is arranged may be adjusted for at least one of the first loop portion LP1 and the second loop portion LP2 such that, when the magnetic field M acting on the first loop portion LP1 and the second loop portion LP2 changes, the induced current IC generated in one of the first loop portion LP1 and the second loop portion LP2 cancels out the induced current IC generated in the other (angle adjustment step). For example, the angle of the arrangement surface on which the first wiring 11 and the second wiring 12 are arranged may be adjusted such that the induced currents IC generated in the first loop portion LP1 and the second loop portion LP2 are approximately equal to each other. Alternatively, unlike the above-described configuration, in a case where the first loop portion LP1 is arranged on a first arrangement surface and the second loop portion LP2 is arranged on a second arrangement surface different from the first arrangement surface, the angle of at least one of the first arrangement surface and the second arrangement surface may

be adjusted such that the induced currents IC generated in the first loop portion LP1 and the second loop portion LP2 are approximately equal to each other.

[0046] In the measurement step, the measurement value corresponding to the current flowing through the first wiring 11 and the second wiring 12 is measured by the measurement instrument 5 while irradiating the semiconductor device S with the light beam L. As a result, the electrical response of the semiconductor device S caused by irradiating the semiconductor device S with the light beam L is observed. For example, in the case of OBIRCH analysis, the semiconductor device S is irradiated with the light beam L in a state in which power is supplied from the power supply 4 to the semiconductor device S to drive the semiconductor device S, and a change in electrical resistance caused by a change in temperature at a specific position in the semiconductor device S due to heat generated by irradiation with the light beam L is observed. In the measurement step, the measurement value is measured by the measurement instrument 5 in a state in which the first loop portion LP1 and the second loop portion LP2 are formed by the preparation step. As a result, measurement can be performed in a state in which current noise caused by the induced currents IC generated in the first loop portion LP1 and the second loop portion LP2 is reduced.

[Functions and Effects]

[0047] In the measurement method according to the embodiment, the measurement value corresponding to the current flowing through the first wiring 11 and the second wiring 12 is measured in a state in which the first loop portion LP1 and the second loop portion LP2, in which the

directions of current flow are opposite to each other when viewed from the predetermined direction D, are formed by the first wiring 11 and the second wiring 12. As a result, when the magnetic field acting on the first loop portion LP1 and the second loop portion LP2 changes (change M in the magnetic field), the induced current IC generated in one of the first loop portion LP1 and the second loop portion LP2 cancels out the induced current IC generated in the other. As a result, current noise caused by electromagnetic induction can be reduced. As described above, according to the measurement method according to the embodiment, current noise can be reduced, and current noise caused by a magnetic field can be canceled.

[0048] In the preparation step, the arrangement of the first wiring 11 and the second wiring 12 may be adjusted such that, when the magnetic field acting on the first loop portion LP1 and the second loop portion LP2 changes, the induced current IC generated in one of the first loop portion LP1 and the second loop portion LP2 cancels out the induced current IC generated in the other. In this case, the induced currents IC generated in the first loop portion LP1 and the second loop portion LP2 can be reliably caused to cancel each other out.

[0049] In the preparation step, the loop area of at least one of the first loop portion LP1 and the second loop portion LP2 when viewed from the predetermined direction D may be adjusted such that, when the magnetic field acting on the first loop portion LP1 and the second loop portion LP2 changes, the induced current IC generated in one of the first loop portion LP1 and the second loop portion LP2 cancels out the induced current IC generated in the other. In this case, the induced

currents IC generated in the first loop portion LP1 and the second loop portion LP2 can be reliably caused to cancel each other out.

[0050] In the preparation step, the angle of the plane on which the loop portion is arranged may be adjusted for at least one of the first loop portion LP1 and the second loop portion LP2 such that, when the magnetic field acting on the first loop portion LP1 and the second loop portion LP2 changes, the induced current IC generated in one of the first loop portion LP1 and the second loop portion LP2 cancels out the induced current IC generated in the other. In this case, the induced currents IC generated in the first loop portion LP1 and the second loop portion LP2 can be reliably caused to cancel each other out.

[0051] In the preparation step, an even number of loop portions (the first loop portion LP1 and the second loop portion LP2) (two in the above example) are formed. As a result, the induced currents IC generated in the loop portions can be easily caused to cancel each other out as compared with a case where an odd number of loop portions are formed.

[0052] In the preparation step, the first loop portion LP1 and the second loop portion LP2 are formed so as to be located on the same plane. As a result, the induced currents IC generated in the first loop portion LP1 and the second loop portion LP2 can be easily caused to cancel each other out.

[Modifications]

[0053] In a first modification illustrated in FIG. 3, the first wiring 11 is constituted by a coaxial cable 15 having an inner conductor 15a (first conductor) and an outer conductor 15b (second conductor) disposed outside the inner conductor 15a. The second wiring 12 is constituted by

a coaxial cable 16 having an inner conductor 16a (first conductor) and an outer conductor 16b (second conductor) disposed outside the inner conductor 16a. For example, the inner conductors 15a and 16a are constituted by metal wires constituting the core material of the coaxial cable, and the outer conductors 15b and 16b are constituted by the metal braid of the coaxial cable.

[0054] The trunk wiring 13 is constituted by a triaxial cable 17 having an inner conductor 17a, an outer conductor 17c disposed outside the inner conductor 17a, and an intermediate conductor 17b disposed between the inner conductor 17a and the outer conductor 17c. A triaxial cable includes, for example, an inner conductor composed of a metal wire constituting a core material, a tubular first insulating layer surrounding the inner conductor, an intermediate conductor composed of, for example, a tubular first metal braid surrounding the first insulating layer, a tubular second insulating layer surrounding the intermediate conductor, an outer conductor composed of, for example, a tubular second metal braid surrounding the second insulating layer, and a tubular insulator (sheath) surrounding the outer conductor. For example, the inner conductor 17a is constituted by the metal wire, the intermediate conductor 17b is constituted by the first metal braid, and the outer conductor 14b is constituted by the second metal braid.

[0055] One end portion of the triaxial cable 17 is provided with, for example, a BNC (Bayonet Neill Concelman) connector 18, and the inner conductor 17a and the intermediate conductor 17b of the triaxial cable 17 are electrically connected to the measurement instrument 5 via the BNC connector 18. The outer conductor 17c of the triaxial cable 17 is

electrically connected to ground. Note that a triaxial connector may be provided instead of the BNC connector 18.

[0056] The inner conductor 15a of the coaxial cable 15 constituting the first wiring 11 is electrically connected to the semiconductor device S, and the outer conductor 15b of the coaxial cable 15 is electrically connected to the ground. More specifically, one end portion of the inner conductor 15a is provided with the first pin P1, and the one end portion of the inner conductor 15a is electrically connected to the semiconductor device S via the first pin P1. The other end portion of the inner conductor 15a is electrically connected to the inner conductor 17a of the triaxial cable 17 constituting the trunk wiring 13. The outer conductor 15b of the coaxial cable 15 is electrically connected to the outer conductor 17c of the triaxial cable 17, and is electrically connected to the ground via the outer conductor 17c.

[0057] The inner conductor 16a of the coaxial cable 16 constituting the second wiring 12 is electrically connected to the semiconductor device S, and the outer conductor 16b of the coaxial cable 16 is electrically connected to the ground. More specifically, one end portion of the inner conductor 16a is provided with the second pin P2, and the one end portion of the inner conductor 16a is electrically connected to the semiconductor device S via the second pin P2. The other end portion of the inner conductor 16a is electrically connected to the intermediate conductor 17b of the triaxial cable 17 constituting the trunk wiring 13. The outer conductor 16b of the coaxial cable 16 is electrically connected to the outer conductor 17c of the triaxial cable 17 together with the outer conductor 15b of the coaxial cable 15, and is electrically connected to

the ground via the outer conductor 17c.

[0058] Also in the first modification, as in the above embodiment, the measurement value is measured by the measurement instrument 5 in a state in which the first wiring 11 and the second wiring 12 are arranged so as to cross each other at the intersection point A, and the first loop portion LP1 and the second loop portion LP2 are formed.

[0059] According to such a first modification as well, current noise can be reduced as in the above embodiment. In addition, the first wiring 11 and the second wiring 12 are constituted by the coaxial cables 15 and 16 having the inner conductors 15a and 16a and the outer conductors 15b and 16b disposed outside the inner conductors 15a and 16a. For the first wiring 11 and the second wiring 12, the inner conductors 15a and 16a of the coaxial cables 15 and 16 are electrically connected to the semiconductor device S, and the outer conductors 15b and 16b of the coaxial cables 15 and 16 are electrically connected to the ground. As a result, since the outer conductors 15b and 16b of the coaxial cables 15 and 16 constituting the first wiring 11 and the second wiring 12 are electrically connected to the ground, electrostatic noise generated in the first wiring 11 and the second wiring 12 can be reduced.

[0060] In addition, the first wiring 11 and the second wiring 12 are connected to the triaxial cable 17 having the inner conductor 17a, the outer conductor 17c disposed outside the inner conductor 17a, and the intermediate conductor 17b disposed between the inner conductor 17a and the outer conductor 17c. The inner conductor 15a of the coaxial cable 15 constituting the first wiring 11 is electrically connected to the inner conductor 17a of the triaxial cable 17. The inner conductor 16a of

the coaxial cable 16 constituting the second wiring 12 is electrically connected to the intermediate conductor 17b of the triaxial cable 17. For the first wiring 11 and the second wiring 12, the outer conductors 15b and 16b of the coaxial cables 15 and 16 are electrically connected to the outer conductor 17c of the triaxial cable 17. As a result, the outer conductors 15b and 16b of the coaxial cables 15 and 16 constituting the first wiring 11 and the second wiring 12 can be electrically connected to the ground using the triaxial cable 17.

[0061] A second modification illustrated in FIG. 4 differs from the first modification in the following points. In the second modification, one end portion of the outer conductor 15b of the coaxial cable 15 constituting the first wiring 11 and one end portion of the outer conductor 16b of the coaxial cable 16 constituting the second wiring 12 are electrically connected to each other by a wiring 19. As in the case of the first modification, the other end portions of the outer conductors 15b and 16b of the coaxial cables 15 and 16 are electrically connected to the outer conductor 17c of the triaxial cable 17, and are electrically connected to the ground via the outer conductor 17c. Therefore, in the second modification, a closed circuit connected to the ground is formed by the outer conductors 15b and 16b of the coaxial cables 15 and 16 and the outer conductor 17c of the triaxial cable 17.

[0062] In addition, in the second modification, an annular core member 20 surrounding a part of each of the first wiring 11 and the second wiring 12 in the longitudinal direction is provided. The core member 20 is formed of, for example, a material having high magnetic permeability. The core member 20 may be, for example, a ferrite core, a nanocrystal

core, or the like. By providing the core member 20, the frequency band in which the effect of reducing current noise is achieved can be expanded toward the lower frequency side.

[0063] According to such a second modification as well, current noise can be reduced as in the above embodiment. In addition, the first wiring 11 and the second wiring 12 are constituted by the coaxial cables 15 and 16 having the inner conductors 15a and 16a (first conductors) and the outer conductors 15b and 16b (second conductors), and for the first wiring 11 and the second wiring 12, one end portions of the inner conductors 15a and 16a are electrically connected to the semiconductor device S, and one end portion of the outer conductor 15b of the coaxial cable 15 constituting the first wiring 11 and one end portion of the outer conductor 16b of the coaxial cable 16 constituting the second wiring 12 are electrically connected to each other. Then, for the first wiring 11 and the second wiring 12, the other end portions of the outer conductors 15b and 16b are electrically connected to the ground. As a result, since the outer conductors 15b and 16b of the coaxial cables 15 and 16 constituting the first wiring 11 and the second wiring 12 are electrically connected to the ground, electrostatic noise generated in the first wiring 11 and the second wiring 12 can be reduced. In addition, since the one end portion of the outer conductor 15b of the coaxial cable 15 constituting the first wiring 11 and the one end portion of the outer conductor 16b of the coaxial cable 16 constituting the second wiring 12 are electrically connected to each other, current noise caused by electromagnetic induction can be reduced as compared with a case where they are not electrically connected to each other. That is, by connecting the one end

portions of the outer conductors 15b and 16b of the coaxial cables 15 and 16 constituting the first wiring 11 and the second wiring 12 to each other, it is possible to form a closed circuit connected to the ground with respect to the outer conductors 15b and 16b, and as a result, current noise caused by electromagnetic induction can be reduced.

[0064] A third modification illustrated in FIG. 5 differs from the first modification in the following points. In the third modification, the first wiring 11 is constituted by a twist cable 21 in which a first conductor 21a (wiring) and a second conductor 21b (wiring) are twisted together, and the second wiring 12 is constituted by a twist cable 22 in which a first conductor 22a (wiring) and a second conductor 22b (wiring) are twisted together.

[0065] The first conductor 21a of the twist cable 21 constituting the first wiring 11 is electrically connected to the semiconductor device S, and the second conductor 21b of the twist cable 21 is electrically connected to the ground. More specifically, one end portion of the first conductor 21a is provided with the first pin P1, and the one end portion of the first conductor 21a is electrically connected to the semiconductor device S via the first pin P1. The other end portion of the first conductor 21a is electrically connected to the inner conductor 17a of the triaxial cable 17 constituting the trunk wiring 13.

[0066] The first conductor 22a of the twist cable 22 constituting the second wiring 12 is electrically connected to the semiconductor device S, and the second conductor 22b of the twist cable 22 is electrically connected to the ground. More specifically, one end portion of the first conductor 22a is provided with the second pin P2, and the one end

portion of the first conductor 22a is electrically connected to the semiconductor device S via the second pin P2. The other end portion of the first conductor 22a is electrically connected to the outer conductor 17c of the triaxial cable 17 constituting the trunk wiring 13.

[0067] According to such a first modification as well, current noise can be reduced as in the above embodiment. In addition, since the second conductors 21b and 21b of the twist cables 21 and 22 constituting the first wiring 11 and the second wiring 12 are electrically connected to the ground, electrostatic noise generated in the first wiring 11 and the second wiring 12 can be reduced. Note that the twist cable 21 may be a twist cable in which three or more wirings including the first conductor 21a and the second conductor 21b are twisted together. The same applies to the twist cable 22.

[0068] A fourth modification illustrated in FIG. 6 differs from the second modification in the following points. In the fourth modification, the first wiring 11 and the second wiring 12 are not arranged so as to cross each other, and the measurement value is measured by the measurement instrument 5 in a state in which only one loop portion is formed by the first wiring 11 and the second wiring 12. In addition, the core member 20 is not provided.

[0069] The measurement method using the measurement device 1 of the fourth modification is “a measurement method including: a preparation step of electrically connecting the first wiring 11 and the second wiring 12 to the semiconductor device S; and a measurement step of measuring, by the measurement instrument 5, a measurement value corresponding to a current flowing through the first wiring 11 and the second wiring 12

while irradiating the semiconductor device S with the light beam L, in order to observe an electrical response of the semiconductor device S caused by irradiating the semiconductor device S with the light beam L, wherein the first wiring 11 and the second wiring 12 are constituted by the coaxial cables 15 and 16 (cables) having the inner conductors 15a and 16a (first conductors) and the outer conductors 15b and 16b (second conductors), and in the preparation step, for the first wiring 11 and the second wiring 12, one end portions of the inner conductors 15a and 16a are electrically connected to the semiconductor device S, one end portion of the outer conductor 15b of the coaxial cable 15 constituting the first wiring 11 and one end portion of the outer conductor 16b of the coaxial cable 16 constituting the second wiring 12 are electrically connected to each other, and for the first wiring 11 and the second wiring 12, the other end portions of the outer conductors 15b and 16b are electrically connected to the ground." In this measurement method, since the outer conductors 15b and 16b of the coaxial cables 15 and 16 constituting the first wiring 11 and the second wiring 12 are electrically connected to the ground, electrostatic noise generated in the first wiring 11 and the second wiring 12 can be reduced. In addition, since the one end portion of the outer conductor 15b of the coaxial cable 15 constituting the first wiring 11 and the one end portion of the outer conductor 16b of the coaxial cable 16 constituting the second wiring 12 are electrically connected to each other, current noise caused by electromagnetic induction can be reduced as compared with a case where they are not electrically connected to each other. That is, by connecting the one end portions of the outer conductors 15b and 16b of the coaxial cables 15 and 16 constituting the first wiring

11 and the second wiring 12 to each other, it is possible to form a closed circuit connected to the ground with respect to the outer conductors 15b and 16b, and as a result, current noise caused by electromagnetic induction can be reduced.

[0070] In addition, the measurement method using the measurement device 1 of the fourth modification is “a measurement method wherein in the preparation step, the first wiring 11 and the second wiring 12 are connected to a triaxial cable 17 having an inner conductor 17a, an outer conductor 17c disposed outside the inner conductor 17a, and an intermediate conductor 17b disposed between the inner conductor 17a and the outer conductor 17c, the other end portion of the inner conductor 15a (first conductor) of the first wiring 11 is electrically connected to the inner conductor 17a of the triaxial cable 17, the other end portion of the inner conductor 16a (first conductor) of the second wiring 12 is electrically connected to the intermediate conductor 17b of the triaxial cable 17, and for the first wiring 11 and the second wiring 12, the other end portions of the outer conductors 15b and 16b are electrically connected to the outer conductor 17c of the triaxial cable 17.” As a result, the outer conductors 15b and 16b of the first wiring 11 and the second wiring 12 can be electrically connected to the ground using the triaxial cable 17.

[0071] As in a fifth modification illustrated in FIG. 7, in the fourth modification, an annular core member 20 surrounding a part of each of the first wiring 11 and the second wiring 12 in the longitudinal direction may be provided. In this case, by providing the core member 20, the frequency band in which the effect of reducing current noise is achieved

can be expanded toward the lower frequency side.

[0072] As in a sixth modification illustrated in FIG. 8, in the fourth modification, the first wiring 11 may be constituted by a twist cable 21 in which a first conductor 21a (wiring) and a second conductor 21b (wiring) are twisted together, and the second wiring 12 may be constituted by a twist cable 22 in which a first conductor 22a (wiring) and a second conductor 22b (wiring) are twisted together. According to such a sixth modification as well, current noise can be reduced as in the fourth modification.

[0073] In a seventh modification illustrated in FIG. 9, the measurement device 1 further includes a jig 30. The jig 30 is a diamond lattice-shaped member having a first portion 31 and a second portion 32 extending so as to intersect the first portion 31. The first portion 31 and the second portion 32 are formed, for example, in a plate shape extending straight. The first portion 31 and the second portion 32 are fixed to each other at a fulcrum P by a fixing member such as a screw, and are relatively rotatable about the fulcrum P (pantograph mechanism). By the first portion 31 and the second portion 32 relatively rotating about the fulcrum P, the angle between the first portion 31 and the second portion 32 changes. In addition, the first portion 31 and the second portion 32 are relatively slidably movable. For example, a groove extending along the extending direction of the first portion 31 or the second portion 32 is formed in at least one of the first portion 31 and the second portion 32, and the fixing member constituting the fulcrum P moves within the groove, whereby the first portion 31 and the second portion 32 are relatively slidably movable.

[0074] In the measurement device 1 of the seventh modification, during measurement (in the preparation step), the first wiring 11 is arranged on the first portion 31 along the first portion 31, and the second wiring 12 is arranged on the second portion 32 along the second portion 32. As a result, the first loop portion LP1 and the second loop portion LP2, in which the directions of current flow are opposite to each other when viewed from the predetermined direction D, are formed by the first wiring 11 and the second wiring 12. The first wiring 11 may or may not be fixed to the first portion 31. The second wiring 12 may or may not be fixed to the second portion 32.

[0075] According to such a seventh modification as well, current noise can be reduced as in the above embodiment. In addition, since the first loop portion LP1 and the second loop portion LP2 can be formed by arranging the first wiring 11 and the second wiring 12 on the jig 30, the work of arranging the first wiring 11 and the second wiring 12 can be facilitated. In addition, the first portion 31 and the second portion 32 are connected to each other so as to be relatively rotatable and slidably movable. As a result, the shape of the first loop portion LP1 and the second loop portion LP2 can be adjusted by relatively rotating the first portion 31 and the second portion 32. For example, by relatively rotating the first portion 31 and the second portion 32, the shape of the first loop portion LP1 and the second loop portion LP2 can be adjusted such that the distance between the trunk wiring 13 and the semiconductor device S becomes a desired distance. In addition, the loop areas of the first loop portion LP1 and the second loop portion LP2 can be adjusted by relatively sliding the first portion 31 and the second portion 32. That is,

in the measurement method of the seventh modification, in the above-described adjustment step, the shape and loop areas of the first loop portion LP1 and the second loop portion LP2 can be adjusted by relatively rotating or sliding the first portion 31 and the second portion 32.

[0076] In an eighth modification illustrated in FIG. 10, in the seventh modification, the jig 30 further has a third portion 33, a fourth portion 34 extending so as to intersect the third portion 33, a fifth portion 35, and a sixth portion 36 extending so as to intersect the fifth portion 35. One end of the third portion 33 is connected to one end of the first portion 31, and the other end of the third portion 33 is connected to one end of the fifth portion. One end of the fourth portion 34 is connected to one end of the second portion 32, and the other end of the fourth portion 34 is connected to one end of the sixth portion. The third portion 33 and the fourth portion 34 are connected to each other so as to be relatively rotatable and slidably movable. The fifth portion 35 and the sixth portion 36 are connected to each other so as to be relatively rotatable and slidably movable.

[0077] In the eighth modification, during measurement (in the preparation step), the first wiring 11 is arranged on the first portion 31, the third portion 33, and the fifth portion 35 along these portions, and the second wiring 12 is arranged on the second portion 32, the fourth portion 34, and the sixth portion 36 along these portions. As a result, two pairs of loop portions, in which the directions of current flow are opposite to each other when viewed from the predetermined direction D, are formed by the first wiring 11 and the second wiring 12. FIG. 10 illustrates these

four loop portions LP. According to such an eighth modification as well, current noise can be reduced as in the above embodiment.

[0078] The present disclosure is not limited to the above embodiment and modifications. For example, the materials and shapes of each component are not limited to the materials and shapes described above, and various materials and shapes can be adopted. The number of loop portions, in which the directions of current flow are opposite to each other when viewed from the predetermined direction D, formed by the first wiring 11 and the second wiring 12 is not limited to two, and three or more loop portions may be formed. For example, when three loop portions are formed, it is sufficient that the directions of current flow when viewed from the predetermined direction D are opposite to each other in two of the three loop portions. In this manner, an odd number of loop portions may be formed.

[0079] In the preparation step, the adjustment step need not be performed. The first loop portion LP1 and the second loop portion LP2 need not be located on the same plane, and may be located on mutually different planes. In the seventh modification, the first portion 31 and the second portion 32 may not be relatively rotatable, and only relative sliding movement may be possible. Alternatively, the first portion 31 and the second portion 32 may not be relatively slidably movable, and only relative rotation may be possible. That is, it is sufficient that at least one of relative rotation and sliding movement is possible between the first portion 31 and the second portion 32. The first portion 31 and the second portion 32 may be connected so as to be incapable of either relative rotation or sliding movement. For example, the first portion 31

and the second portion 32 may be fixed so as to be incapable of relative movement. In the present disclosure, “A and/or B” means at least one of A and B.

Reference Signs List

[0080] 1: Measurement device, 2: Light source, 5: Measurement instrument, 11: First wiring, 12: Second wiring, 15, 16: Coaxial cable, 15a, 16a: Inner conductor (first conductor), 15b, 16b: Outer conductor (second conductor), 17: Triaxial cable, 17a: Inner conductor, 17b: Intermediate conductor, 17c: Outer conductor, 21, 22: Twist cable, 21a, 22a: First conductor (wiring), 21b, 22b: Second conductor (wiring), 30: Jig, 31: First portion, 32: Second portion, D: Predetermined direction, L: Light beam, LP1: First loop portion, LP2: Second loop portion, S: Semiconductor device.

CLAIMS

[Claim 1] A measurement method comprising:

a preparation step of electrically connecting a first wiring and a second wiring to a semiconductor device; and

a measurement step of measuring, by a measurement instrument, a measurement value corresponding to a current flowing through the first wiring and the second wiring while irradiating the semiconductor device with a light beam, in order to observe an electrical response of the semiconductor device caused by irradiating the semiconductor device with the light beam, wherein

in the preparation step, the first wiring and the second wiring are arranged such that the first wiring and the second wiring form at least two loop portions in which directions of current flow are opposite to each other when viewed from a predetermined direction, and

in the measurement step, the measurement value is measured in a state in which the two loop portions are formed.

[Claim 2] The measurement method according to claim 1, wherein in the preparation step, the arrangement of the first wiring and the second wiring is adjusted such that, when the magnetic field acting on the two loop portions changes, the induced current generated in one of the two loop portions cancels out the induced current generated in the other of the two loop portions.

[Claim 3] The measurement method according to claim 1 or 2, wherein in the preparation step, a loop area of at least one of the two loop portions when viewed from the predetermined direction is adjusted such that, when the magnetic field acting on the two loop portions changes,

the induced current generated in one of the two loop portions cancels out the induced current generated in the other of the two loop portions.

[Claim 4] The measurement method according to any one of claims 1 to 3, wherein in the preparation step, an angle of a plane on which the loop portion is arranged is adjusted for at least one of the two loop portions such that, when the magnetic field acting on the two loop portions changes, the induced current generated in one of the two loop portions cancels out the induced current generated in the other of the two loop portions.

[Claim 5] The measurement method according to any one of claims 1 to 4, wherein in the preparation step, the loop portions are formed in an even number.

[Claim 6] The measurement method according to any one of claims 1 to 5, wherein in the preparation step, the two loop portions are formed so as to be located on the same plane.

[Claim 7] The measurement method according to any one of claims 1 to 6, wherein each of the first wiring and the second wiring is constituted by a coaxial cable including an inner conductor and an outer conductor disposed outside the inner conductor, and

in the preparation step, for each of the first wiring and the second wiring, the inner conductor of the coaxial cable is electrically connected to the semiconductor device, and the outer conductor of the coaxial cable is electrically connected to ground.

[Claim 8] The measurement method according to claim 7, wherein in the preparation step, the first wiring and the second wiring are connected to a triaxial cable including an inner conductor, an outer

conductor disposed outside the inner conductor, and an intermediate conductor disposed between the inner conductor and the outer conductor,

the inner conductor of the coaxial cable constituting one of the first wiring and the second wiring is electrically connected to the inner conductor of the triaxial cable, the inner conductor of the coaxial cable constituting the other of the first wiring and the second wiring is electrically connected to the intermediate conductor of the triaxial cable, and for each of the first wiring and the second wiring, the outer conductor of the coaxial cable is electrically connected to the outer conductor of the triaxial cable.

[Claim 9] The measurement method according to any one of claims 1 to 6, wherein each of the first wiring and the second wiring is constituted by a cable including a first conductor and a second conductor, and

in the preparation step,

for each of the first wiring and the second wiring, one end portion of the first conductor is electrically connected to the semiconductor device,

one end portion of the second conductor of the cable constituting the first wiring and one end portion of the second conductor of the cable constituting the second wiring are electrically connected to each other, and

for each of the first wiring and the second wiring, the other end portion of the second conductor is electrically connected to ground.

[Claim 10] The measurement method according to claim 9, wherein

the cable is a coaxial cable including an inner conductor and an outer conductor disposed outside the inner conductor, the first conductor is the inner conductor, and the second conductor is the outer conductor.

[Claim 11] The measurement method according to claim 9, wherein the cable is a twist cable in which at least two wirings are twisted together, the first conductor is one of the two wirings, and the second conductor is the other of the two wirings.

[Claim 12] The measurement method according to any one of claims 1 to 11, wherein in the preparation step, the two loop portions are formed by using a jig including a first portion and a second portion extending so as to intersect the first portion, arranging the first wiring on the first portion along the first portion, and arranging the second wiring on the second portion along the second portion.

[Claim 13] The measurement method according to claim 12, wherein the first portion and the second portion are connected to each other so as to be relatively rotatable and/or slidably movable.

[Claim 14] A measurement device for observing an electrical response of a semiconductor device caused by irradiating the semiconductor device with a light beam, the measurement device comprising:

a light source that outputs the light beam;

a first wiring and a second wiring electrically connected to the semiconductor device;

a measurement instrument electrically connected to the first wiring and the second wiring, and configured to measure a measurement value corresponding to a current flowing through the first wiring and the

second wiring during the observation; and

a jig including a first portion and a second portion extending so as to intersect the first portion, the jig being configured such that, when the first wiring is arranged on the first portion along the first portion and the second wiring is arranged on the second portion along the second portion, at least two loop portions in which directions of current flow are opposite to each other when viewed from a predetermined direction are formed by the first wiring and the second wiring.

[Claim 15] The measurement device according to claim 14, wherein the first portion and the second portion are connected to each other so as to be relatively rotatable and/or slidably movable.