

RTMP

- 1 -

SPECIFICATION

This Sheet Has Been Replaced



TITLE OF THE INVENTION

Method for Screening Ceramic Capacitors

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

The present invention relates to a screening method for removing defective pieces of low insulation resistance out of ceramic capacitor products.

2. Description of the Prior Art

10 In the manufacturing process of ceramic capacitors, at its final step, the insulation resistance is measured and products of low resistance values are screened in order to remove defective pieces due to faults of capacitor elements (voids, delaminations, cracks, etc.)
15 that have occurred during manufacture.

Conventionally, for enhancing the accuracy of the screening as described above, there have been adopted such methods as increase in the measurement voltage, polarity inversion in measurement, increase in the measurement time
20 duration, and the like.

Fig. 1 plots the resistance - time characteristic (hereinafter, referred to as charging characteristic) of a non - defective monolithic ceramic capacitor and another monolithic ceramic capacitor having a low insulation
25 resistance due to some fault.

This Sheet Has Been Replaced



- 2 -

The charging characteristic of the non-defective ceramic capacitor shows a variation of resistance value along a curve (A) versus time elapse.

More specifically, the resistance increases
5 linearly in proportion to time until the charging is completed. The resistance is saturated to a resistance value of a dielectric as an insulator when the charging comes to an end.

In contrast, the charging characteristic of a
10 defective ceramic capacitor having a fault generally draws a curve (B), because of a lowered saturated value of a dielectric, as described above, that has lowered in the insulation resistance value due to the fault.

Accordingly, for the screening of ceramic
15 capacitors, it becomes easier to select between non-defective and defective products when the measurement is effected for longer time durations and when the resistance value is measured at points closer to the saturated value.

In actual cases, however, when minute current
20 paths formed at inter-element fault portions of a ceramic capacitor are involved, the ceramic capacitor may, in some cases, partly fuse during the course of the charging time so that the lowering of resistance is recovered as shown by a curve (C) or conversely that the resistance value
25 lowers with deterioration growing with time, as shown by a

- 3 -

This Sheet Has Been Replaced



curve (D).

In other cases, the path itself has semiconductor-like properties so that the resistance value may vary due to heat generation during the passage of a current.

5 Therefore, it can no longer be said that longer time durations are always preferred as the time duration that allows the easiest selection of defective products by the behavior of fault portions (a time duration that causes the largest difference in resistance between non-
10 defective products and fault-containing defective products). This poses a problem that defective pieces cannot be removed out of the products with reliability.

SUMMARY OF THE INVENTION

An object of the present invention is therefore to
15 provide a method for screening ceramic capacitors, which allows an improvement in the screening accuracy of fault-containing defective products exhibiting behavior of various resistance values so that defective pieces can be prevented from mixing in the final products.

20 In order to achieve the above object, the present invention provides a method for screening ceramic capacitors, comprising a step of measuring the insulation resistance by applying a voltage to ceramic capacitors for two or more kinds of different time durations.

25 In the screening of ceramic capacitors, measuring

This Sheet Has Been Replaced



- 4 -

the resistance at a point closer to the saturated value with a voltage applied for a long time makes it possible to remove common faulty defective products of low saturated values.

5 Also, a measurement with a shortened voltage application time makes it possible to remove fault-containing defective products that exhibit behavior of various resistance values by the time when the saturated value is reached. Such measurements of resistance value
10 with different time durations of voltages can eliminate any leaks in the screening of fault-containing defective products, so that an increased accuracy can be attained.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a characteristic view showing the
15 relationship between voltage application time and resistance value in ceramic capacitors.

Fig. 2 is a graph in which the resistance value is measured at different time durations.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

20 Hereinbelow, an embodiment of the present invention is described.

The present invention provides a method for screening defective products in the final process of the manufacture of monolithic ceramic capacitors, the method
25 comprising the step of applying a voltages of two or more

This Sheet Has Been Replaced



- 5 -

kinds of different time durations one ~~after another~~ to a ceramic capacitor, whereby the insulation resistance is measured in each time duration, in order to remove any defective products due to any faults of elements that have
5 occurred in the manufacturing process.

With such measurement of the insulation resistance by applying a voltage two or more times for different time durations as described above, the resistance value can be measured at points closer to the saturated value by virtue
10 of the prolonged voltage application. Thus, the removal of defective products due to common faults can be accomplished.

Also, when the insulation resistance is measured with a shortened voltage application time, it becomes
15 possible to remove fault-containing defective products that exhibit the behavior of variations in the resistance value until the saturated value is reached.

In the screening process in which the insulation resistance is measured by applying a voltage to monolithic
20 ceramic capacitors, the voltage application time that causes the maximum difference in resistance between non-defective and defective products and therefore that allows the easiest selection therebetween is not necessarily a long time duration as described above. Therefore,
25 measuring the resistance value with a voltage applied for

This Sheet Has Been Replaced



- 6 -

two or more kinds of different time durations allows improvement in the accuracy of screening fault-containing defective products.

Further, as shown in Fig. 2, the resistance value of defective does not change fixedly. For example, when fault-containing defective products 1 and 2 are measured at a time of 2 sec., the resistance value of the fault-containing defective product 2 is lower than that of a non-defective and therefore, the fault-containing defective product 2 can be easily found defective at first sight. On the other hand, since the resistance value of the fault-containing defective product 1 is little different from that of the non-defective, the fault-containing defective product 1 can not be easily found defective. However, if the fault-containing defective product 1 is measured at a time of 32 sec., since it is found that the resistance value of the fault-containing defective product 1 is largely different from that of the non-defective, the fault-containing defective product 1 can be found defective.

As mentioned above, finding of non-defective - defective can be assured by measuring the resistance value at two or more kinds of different time durations.

Additionally, in Fig. 2, it seems that defectiveness of both the products can be found by

This Sheet Has Been Replaced



- 7 -

measuring them at a time of 32 sec. However, the fault-
containing defective product 2 displays the low resistance
value on the whole by chance, and there is a case
different from this example as the case may be in which
5 the resistance value recovers in accordance with time
elapse. Therefore, it cannot be simply said that a longer
time duration presents a better result. Higher efficiency
can be achieved by using a short time duration and a long
time duration properly.

10 In addition, the value of the applied voltages as
well as the application time and number of applications of
the voltages for the screening may be arbitrarily chosen
depending on the capacity and the like of ceramic
capacitors.

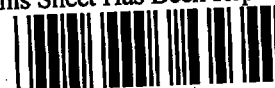
15 As described hereinabove, according to the present
invention, the insulation resistance is measured with a
voltage applied to ceramic capacitors for two or more
kinds of different time durations. Therefore, the
screening accuracy of fault-containing defective products
20 that exhibit behavior of various resistance values is
improved to a substantial extent so that defective
products can be removed with reliability. As a result,
the fault occurrence ratio in use of ceramic capacitors
can be lowered.

25



- 8 -

This Sheet Has Been Replaced



What is claimed is:

1. A method for screening ceramic capacitors, comprising
a step of measuring insulation resistance with a voltage
applied to ceramic capacitors for two or more kinds of
5 different time durations.

10

15

20

25

- 9 -

This Sheet Has Been Replaced



ABSTRACT OF THE DISCLOSURE

The invention provides a screening method which allows an accurate removal of defective products of ceramic capacitors. The insulation resistance is measured with a voltage applied to ceramic capacitors for two or more kinds of different time durations, whereby fault-containing defective products that exhibit behavior of various resistance values are removed. Thus, the accuracy of screening ceramic capacitors is improved.

10

15

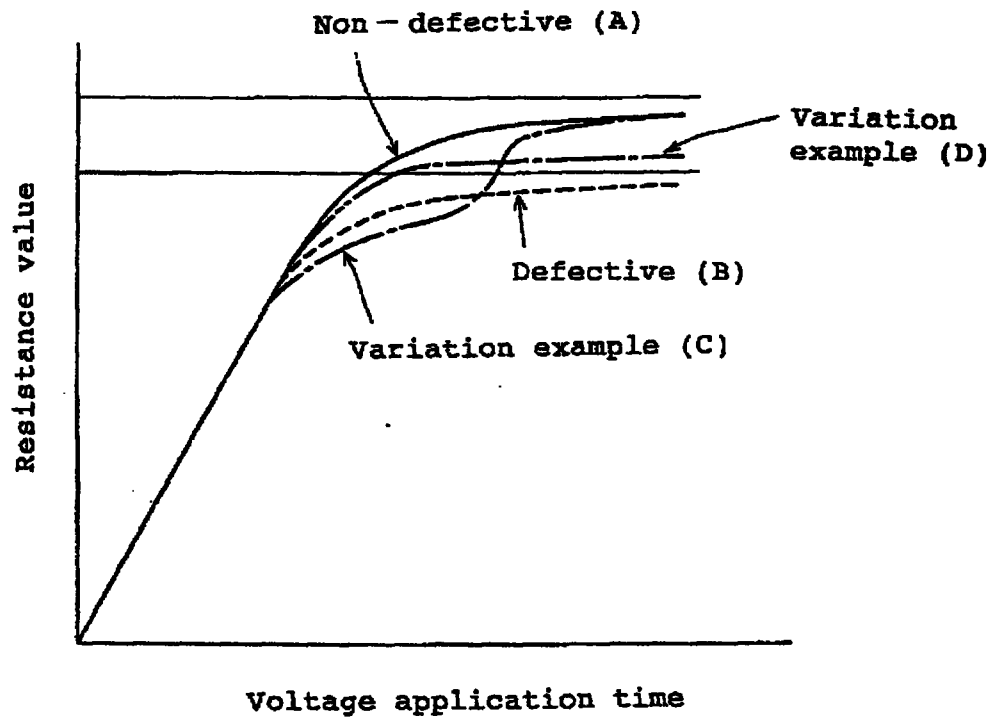
20

25

This Sheet Has Been Replaced



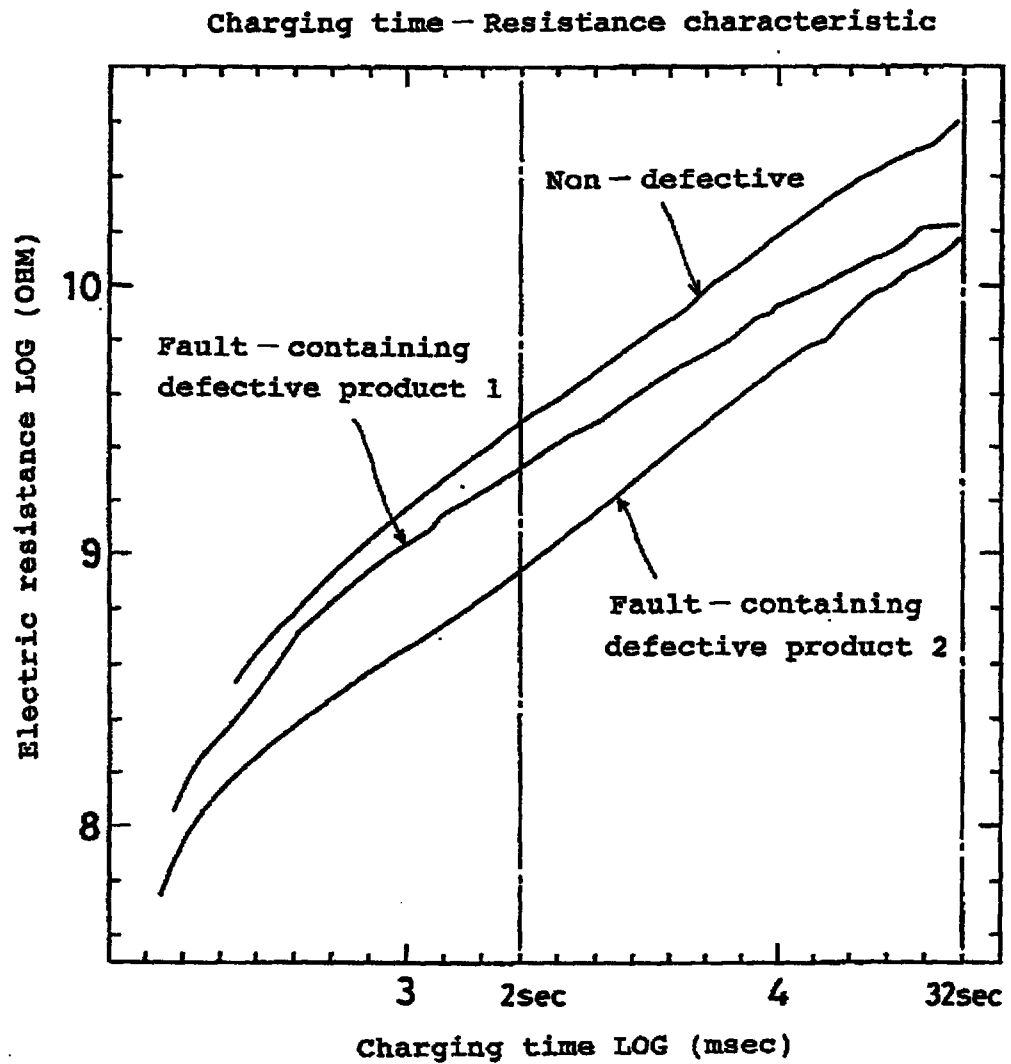
FIG.1



This Sheet Has Been Replaced



FIG.2



SPECIFICATION

TITLE OF THE INVENTION

Method for Screening Ceramic Capacitors

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a screening method for removing defective pieces of low insulation resistance out of ceramic capacitor products.

2. Description of the Prior Art

In the manufacturing process of ceramic capacitors, at its final step, the insulation resistance is measured and products of low resistance values are screened in order to remove defective pieces due to faults of capacitor elements (voids, delaminations, cracks, etc.) that have occurred during manufacture.

Conventionally, for enhancing the accuracy of the screening as described above, there have been adopted such methods as increase in the measurement voltage, polarity inversion in measurement, increase in the measurement time duration, and the like.

Fig. 1 plots the resistance - time characteristic (hereinafter, referred to as charging characteristic) of a non - defective monolithic ceramic capacitor and another monolithic ceramic capacitor having a low insulation resistance due to some fault.

This is the replacement sheet

Date: 27 DEC 1995

The charging characteristic of the non-defective ceramic capacitor shows a variation of resistance value along a curve (A) versus time elapse.

More specifically, the resistance increases linearly in proportion to time until the charging is completed. The resistance is saturated to a resistance value of a dielectric as an insulator when the charging comes to an end.

In contrast, the charging characteristic of a defective ceramic capacitor having a fault generally draws a curve (B), because of a lowered saturated value of a dielectric, as described above, that has lowered in the insulation resistance value due to the fault.

Accordingly, for the screening of ceramic capacitors, it becomes easier to select between non-defective and defective products when the measurement is effected for longer time durations and when the resistance value is measured at points closer to the saturated value.

In actual cases, however, when minute current paths formed at inter-element fault portions of a ceramic capacitor are involved, the ceramic capacitor may, in some cases, partly fuse during the course of the charging time so that the lowering of resistance is recovered as shown by a curve (C) or conversely that the resistance value lowers with deterioration growing with time, as shown by a

This is the replacement sheet

Date: 27 DEC 1995

curve (D).

In other cases, the path itself has semiconductor-like properties so that the resistance value may vary due to heat generation during the passage of a current.

Therefore, it can no longer be said that longer time durations are always preferred as the time duration that allows the easiest selection of defective products by the behavior of fault portions (a time duration that causes the largest difference in resistance between non-defective products and fault-containing defective products). This poses a problem that defective pieces cannot be removed out of the products with reliability.

SUMMARY OF THE INVENTION

An object of the present invention is therefore to provide a method for screening ceramic capacitors, which allows an improvement in the screening accuracy of fault-containing defective products exhibiting behavior of various resistance values so that defective pieces can be prevented from mixing in the final products.

In order to achieve the above object, the present invention provides a method for screening ceramic capacitors, comprising a step of measuring the insulation resistance by applying a voltage to ceramic capacitors for two or more kinds of different time durations.

In the screening of ceramic capacitors, measuring

This is the replacement sheet

Date:

27 DEC 1995

the resistance at a point closer to the saturated value with a voltage applied for a long time makes it possible to remove common faulty defective products of low saturated values.

Also, a measurement with a shortened voltage application time makes it possible to remove fault-containing defective products that exhibit behavior of various resistance values by the time when the saturated value is reached. Such measurements of resistance value with different time durations of voltages can eliminate any leaks in the screening of fault-containing defective products, so that an increased accuracy can be attained.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a characteristic view showing the relationship between voltage application time and resistance value in ceramic capacitors.

Fig. 2 is a graph in which the resistance value is measured at different time durations.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinbelow, an embodiment of the present invention is described.

The present invention provides a method for screening defective products in the final process of the manufacture of monolithic ceramic capacitors, the method comprising the step of applying a voltages of two or more

This is the replacement sheet

Date: 27 DEC 1995

kinds of different time durations one after another to a ceramic capacitor, whereby the insulation resistance is measured in each time duration, in order to remove any defective products due to any faults of elements that have occurred in the manufacturing process.

With such measurement of the insulation resistance by applying a voltage two or more times for different time durations as described above, the resistance value can be measured at points closer to the saturated value by virtue of the prolonged voltage application. Thus, the removal of defective products due to common faults can be accomplished.

Also, when the insulation resistance is measured with a shortened voltage application time, it becomes possible to remove fault - containing defective products that exhibit the behavior of variations in the resistance value until the saturated value is reached.

In the screening process in which the insulation resistance is measured by applying a voltage to monolithic ceramic capacitors, the voltage application time that causes the maximum difference in resistance between non-defective and defective products and therefore that allows the easiest selection therebetween is not necessarily a long time duration as described above. Therefore, measuring the resistance value with a voltage applied for

This is the replacement sheet

Date:

27 DEC 1995

two or more kinds of different time durations allows improvement in the accuracy of screening fault-containing defective products.

Further, as shown in Fig. 2, the resistance value of defective does not change fixedly. For example, when fault-containing defective products 1 and 2 are measured at a time of 2 sec., the resistance value of the fault-containing defective product 2 is lower than that of a non-defective and therefore, the fault-containing defective product 2 can be easily found defective at first sight. On the other hand, since the resistance value of the fault-containing defective product 1 is little different from that of the non-defective, the fault-containing defective product 1 can not be easily found defective. However, if the fault-containing defective product 1 is measured at a time of 32 sec., since it is found that the resistance value of the fault-containing defective product 1 is largely different from that of the non-defective, the fault-containing defective product 1 can be found defective.

As mentioned above, finding of non-defective-defective can be assured by measuring the resistance value at two or more kinds of different time durations.

Additionally, in Fig. 2, it seems that defectiveness of both the products can be found by

This is the replacement sheet

Date: 27 DEC 1995

measuring them at a time of 32 sec. However, the fault-containing defective product 2 displays the low resistance value on the whole by chance, and there is a case different from this example as the case may be in which the resistance value recovers in accordance with time elapse. Therefore, it cannot be simply said that a longer time duration presents a better result. Higher efficiency can be achieved by using a short time duration and a long time duration properly.

In addition, the value of the applied voltages as well as the application time and number of applications of the voltages for the screening may be arbitrarily chosen depending on the capacity and the like of ceramic capacitors.

As described hereinabove, according to the present invention, the insulation resistance is measured with a voltage applied to ceramic capacitors for two or more kinds of different time durations. Therefore, the screening accuracy of fault-containing defective products that exhibit behavior of various resistance values is improved to a substantial extent so that defective products can be removed with reliability. As a result, the fault occurrence ratio in use of ceramic capacitors can be lowered.

This is the replacement sheet

Date: 27 DEC 1995



- 8 -

What is claimed is:

1. A method for screening ceramic capacitors, comprising a step of measuring insulation resistance with a voltage applied to ceramic capacitors for two or more kinds of different time durations.

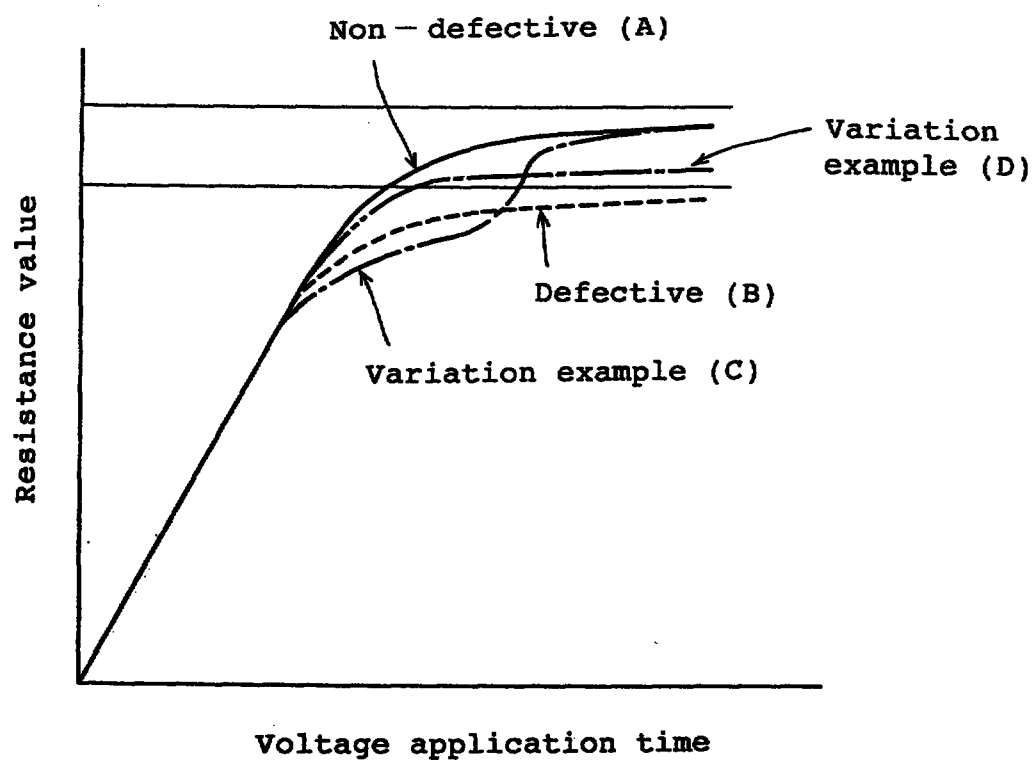
This is the replacement sheet

Date:

27 DEC 1995

FIG.1

- 1 -

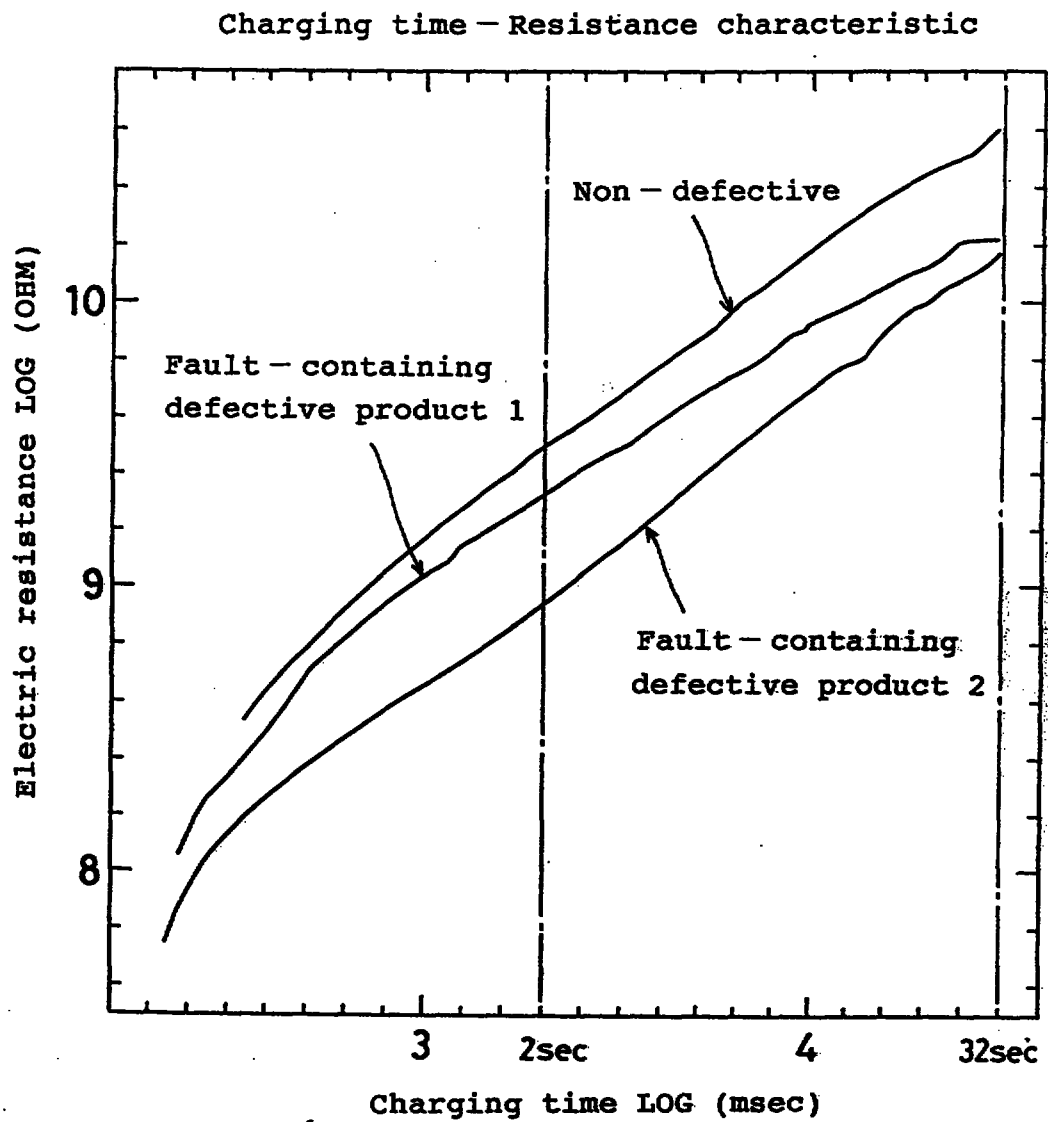


This is the replacement sheet

Date:

27 DEC 1995

FIG.2



This is the replacement sheet

Date:

27 DEC 1995

Method for Screening Ceramic Capacitors
ABSTRACT OF THE DISCLOSURE

The invention provides a screening method which allows an accurate removal of defective products of ceramic capacitors. The insulation resistance is measured with a voltage applied to ceramic capacitors for two or more kinds of different time durations, whereby fault-containing defective products that exhibit behavior of various resistance values are removed. Thus, the accuracy of screening ceramic capacitors is improved.

Figure 2

This Sheet Has Been Replaced



This is the replacement sheet

Date:

27 DEC 1995



TEXT OF THE ABSTRACT

The invention provides a screening method ~~which~~ allows an accurate removal of defective products of ceramic capacitors. The insulation resistance is measured with a voltage applied to ceramic capacitors for two or more kinds of different time durations, whereby fault-containing defective products that exhibit behavior of various resistance values are removed. Thus, the accuracy of screening ceramic capacitors is improved.

This is the replacement sheet

Date:

07 JUN 1996