"Stick-it Flexible" Made of Cerac α®, The Heat Dissipation Material of the 21st Century

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Lighter, more compact, faster and more sophisticated functions, are required of products in the field of electrical and electronic devices in recent years. In order to respond to such needs, further densification is taking place on every level, including semiconductor chips, substrate packaging and device mounting. Unfortunately, such densification brought about an increase in heat generation and the localized concentration of heat, which is causing even more difficulty in terms of coping with heat.

Further, with the conversion of products into household appliances and their personalization as well as mobilization, demand for products with a better appearance and less noise is on the rise. Very strict limitations are being imposed on the designers, as they deal with heat measures by hermetically sealing products, quietening cooling fans or implementing heat measures without cooling fans, in order to respond to such needs.

In such circumstances, there are cases when conventional "heat conduction" heat dissipation products (such as heat sinks) and "heat convection" heat dissipation products (such as cooling fans) can no longer offer any solution.

This paper will introduce the new innovative product, "Stick-it Flexible"*1) made of Cerac α*2), which was created with a focus on "radiation" heat dissipation.

Summary of "Stick-it Flexible"

"Stick-it Flexible", is a product that is based on the technology of "Cerac α", a heat-radiating liquid ceramic paint that was developed by Oki Electric in collaboration with Ceramission Co., Ltd.

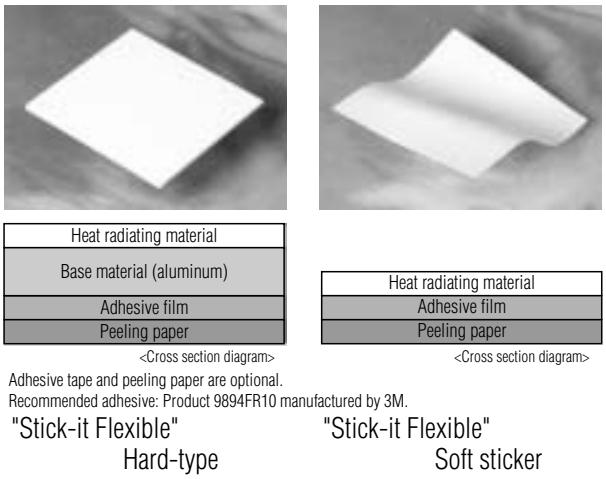

Fig. 1 Stick-it Flexible

This product is an environmentally friendly heat radiating material that is prepared in thin sheets utilizing the features of Cerac α, described below.

(1) The superior radiation characteristics of ceramics converts heat into far infrared radiation (radiation ratio of 0.96).
(2) The product can be formed into film with a thickness of 50 to 150 μm.
(3) The product is friendly to the global environment since it uses inorganic materials and does not contain any specified regulated chemical substances.

Further, there are two types available in the new lineup of "Stick-it Flexible", the "Soft Sticker" and "Hard Type" (Fig. 1). The "Soft Sticker" can easily be bent and has a high tensile strength, yet it is flexible enough to be cut with just a pair of scissors. The "Hard Type" contains aluminum as a raw material that provides superior thermodiffusion characteristics. Heat dissipation is induced by the pasting of one of these "Stick-it Flexible" products in the location where heat measures need to be taken.

Mechanism of heat dissipation

The heat dissipation characteristics of the "Stick-it Flexible", is made possible by the radiation characteristic of "Cerac α", which coats its surface.

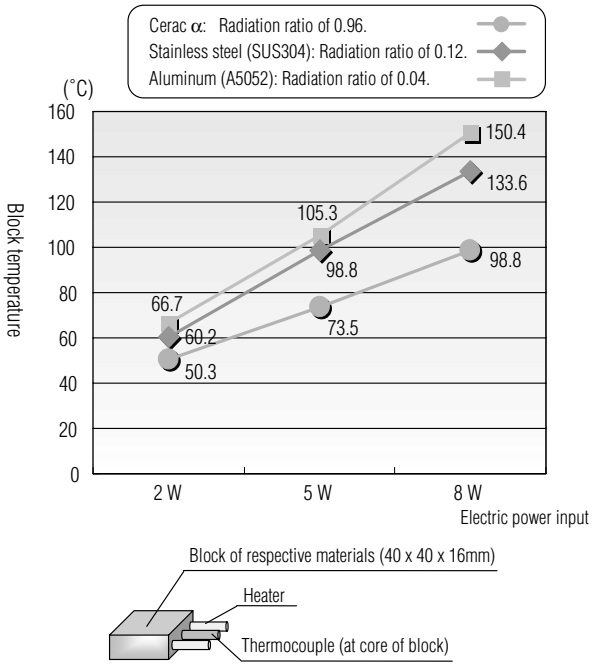

Fig. 2 Heat dissipation of Cerac α

*1) Stick-it Flexible is a registered trademark of Ceramission Co., Ltd.
*2) Cerac α is a registered trademark of Ceramission Co., Ltd.

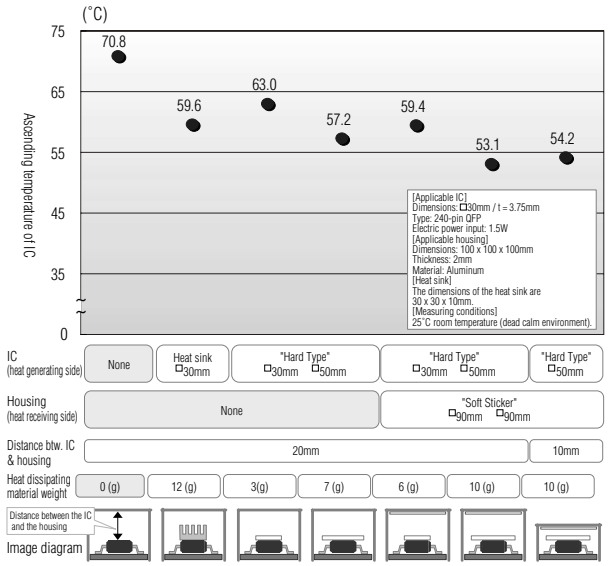

Fig. 3 Heat dissipating characteristics of the Stick-it Flexible

By radiation we mean a transfer of energy by converting heat into far infrared radiation. It is quite a different type of heat transfer from that of conduction or convection methods. In general, the power of radiation is expressed in terms of a radiation ratio. The radiation ratio and heat dissipating characteristics of various substances are shown in Fig. 2. The radiation ratio of Cerac a is extremely high, with superior heat dissipating characteristics.

Further, the heat dissipating features of Cerac a include its capacity to absorb and transfer heat as well as release and transfer heat.

Heat dissipation and the advantages of Stick-it Flexible

In general, electrical and electronic devices are structures that contain a heating element covered by a housing. In conventional equipment design, the heat dissipation of a heating element inside a housing was realized with the installation of cooling fans or openings in the form of ventilation holes. In recent years, however, the tendency has been to avoid the use of cooling fans due to their noise and the accumulation of debris and dust that enter through the ventilation holes, which becomes the source of degradation for the value of the equipment as well as the equipment's reliability. Further, whether a cooling fan or ventilation holes are used or not, a heat sink is mounted on the heating element as a means to dissipate heat.

"Stick-it Flexible" is thinner and much lighter than these heat sinks with a comparable heat dissipating capacity. As a result, it became possible to increase the mounting volume of the device and reduce its weight. Further, by using the "Soft Sticker" and "Hard Type" in conjunction, the heat dissipating characteristics were improved even more (Fig. 3).

It is especially effective when the "Hard Type" is attached to the heating element, while the "Soft Sticker" is applied to the housing (heat receiving surface).

Heating elements often have an uneven temperature distribution, but since the "Hard Type" is made of aluminum raw material, its thermodiffusion and soaking characteristics effectively dissipate heat. Further, by mounting a "Hard Type" with a surface area larger than that of the heating element, it is possible to improve the heat dissipating effects even further.

On the other hand, the application of a "Soft Sticker" is extremely effective as a heat dissipation measure for housings (heat receiving surface), due to its flexibility, light weight and thin characteristics.

The effective heat characteristics of "Stick-it Flexible" contributes toward the miniaturization, weight reduction, noise reduction, life extension, energy conservation and cost reduction of parts, components and devices.

Conclusion

"Stick-it Flexible", with its "radiation" heat dissipating method that is also environmentally friendly, is certainly the heat dissipating material of the 21st century.

It is believed that the importance of this product will grow as a heat reduction measure and that it will become a defacto standard for heat reduction measures in the future.

We intend to continue striving for the best in improvements and the development of future products with the release of more Cerac α application products.

References

1) Naoki Kunimine, Complete Introduction to Thermal Design for Electronics, Nikkan Kogyo Shimbun, 2003.

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