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Panasonic Develops Low-temperature Curing Secondary Mounting Underfill Material that Improves Mounting Reliability of Automotive Parts

Low-temperature curing secondary mounting underfill materials
(February 2017, Panasonic)

Panasonic's "Secondary Mounting Underfill Material" cures at low temperatures and can be used for mount-reinfocement of precision parts that need to be protected from high temperatures.

Osaka, Japan - Panasonic Corporation announced today that it has commercialized a Secondary Mounting Underfill Material [1] that cures at low temperatures. The company will launch its mass production in February 2017. This product is a liquid resin material that penetrates between the circuit board and parts when applied around a part after it is mounted on a circuit board. The product considerably reinforces the mounting. It will improve the mounting reliability of automotive parts, for which high bonding strength is required.

Reliability in demanding environment is essential for automotive parts; however they are becoming more complicated and sophisticated with the development of ADAS, IoT and the like. Since there is a need for high-speed communication and shorter wiring distances, semiconductors and electronic parts are becoming ever more finely wired. As a result, the area available for each solder joint has shrunk, and the loss of joint strength caused by the use of less solder is presenting a challenge. Conventional mount-reinfocement materials for solder joints are cured at a high temperature of 150˚C, but since precision components should not be exposed to high temperatures, there is a growing need for a mount-reinforcement material that cures at low temperatures and does not weaken at high temperatures. Using its unique resin design technologies, Panasonic has developed a mount-reinforcement material that cures at a low temperature of 80˚C. As one of its main features, the glass transition temperature (Tg) [2] of the material is 140˚C or greater, so the state of the material is less likely to change in high temperature environments.

Panasonic's new mount-reinforcement material has the following features:

1. Cures at a low temperature of 80˚C and has a high glass transition temperature (Tg) after curing, achieving the necessary mount reliability for automotive parts

- Glass transition temperature (Tg): 140˚C or greater (Panasonic's conventional product *1: Tg = 100˚C after curing at 80˚C)
- Temperature cycling test: Passed 1000 cycles with a minimum temperature of -55˚C and maximum temperature of 125˚C (Panasonic's conventional product *1: 300 cycles)

2. High Tg, meaning a smaller difference in heat shrinkage with other part materials, reduces the stress applied to the solder balls [3]

- Stress around each solder ball: Reduced by 58% (without underfill: 106.5 kgf/mm²; with underfill: 44.8 kgf/mm²)

3. Low viscosity, suitable for mounting in areas with small gaps

Notes:

*1: Panasonic's conventional product: Secondary mounting underfill material (product number: CV5313)

Suitable applications:

Mount reinforcement of semiconductor packages and electronic parts mainly for automotive camera modules, communication modules (millimeter-wave radar modules) and ECU(electronic control unit)

[Panasonic Technology]

1. Cures at a low temperature of 80˚C and has a high glass transition temperature (Tg) after curing, achieving the mount reliability needed for automotive parts

There is a growing need for a mount-reinforcement material that cures at low temperatures for precision components, such as sensors, which should not be exposed to high temperatures. It is also important to ensure that automotive part materials pass the temperature cycling test, in which they are exposed to high and low temperature extremes, to guarantee their suitability for use in demanding environments. Various types of mount-reinforcement materials are therefore needed. Panasonic has developed a mount-reinforcement material that cures at low temperatures of 80˚C and achieves a high glass transition temperature (Tg) of 140˚C or greater by applying its unique in-house-developed resin design technology. It will enable the mount reliability required for automotive parts. The material is also suitable for parts that require rapid curing. Since it achieves a Tg of 140˚C or greater after curing for ten minutes at 150˚C, it can be used in a variety of environments.

2. High Tg, meaning a smaller difference in heat shrinkage with other part materials, reduces stress on the solder balls.

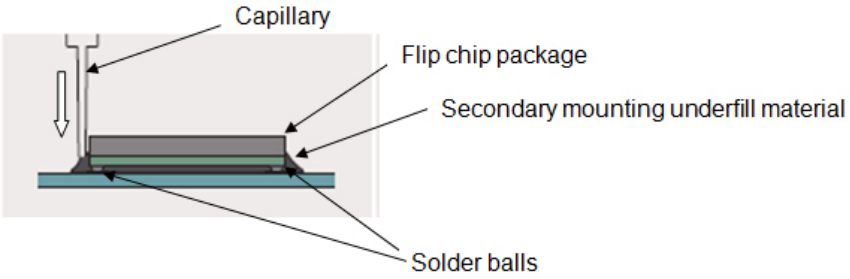
Ensuring connection reliability for automotive parts is becoming increasingly difficult due to the problems of cracks and peeling. Because semiconductor packages and electronic parts are becoming more densely mounted, the area available for solder joints is shrinking, thereby concentrating the stress they experience. Panasonic has developed a reactive control technology that enables the creation of high Tg resins, even at low curing temperatures. It will minimize the difference in heat shrinkage between the material and the circuit board, reducing the stress on the solder balls. The new material is suitable for mount-reinforcement of semiconductor packages and electronic parts mainly for automotive camera modules and communication modules.

3. Low viscosity, suitable for mounting in areas with small gaps

The gold bumps (electrodes for connecting a chip to the circuit board) used for part materials of millimeter-wave radar can make very small gaps between electrical part and circuit board , resulting in an especially small joint area that made it prone to peeling and cracks during the temperature cycling test if a mount-reinforcement material was not applied. Panasonic has

developed a low-viscosity mount-reinforcement material by applying its own resin design technology. It shows excellent adhesion to the circuit board, gold bumps and the chip, and is suitable for mount-reinforcement of gold bump-type wafer level packaging (WLP) and for improving connection reliability.

[Cross Section of a Circuited Board Being Mounted]



[Basic Specifications]

Product No.	CV5350AS
Minimum flow gap (μm)	20
Viscosity (mPa· s, 25˚C)	4000
Tg (˚C)	150
C.T.E.1 (ppm/˚C)	30
Elastic modulus (GPa, 25˚C)	10
Potential for reworking	Not possible

[Term Descriptions]

[1] Secondary mounting underfill material
Secondary mounting underfill material is a reinforcement material that retains and improves the connection reliability of mounting. Mounting (secondary mounting) means to place a semiconductor package or an electronic part on a circuit board, including a motherboard, in such a way that they can be electrically connected. The material is a liquid resin, which hardens into an insoluble and non-melting material after being injected, sealed and thermally cured.
[2] Glass transition temperature (Tg)
Glass transition is a transition phenomenon in which a material such as a polymer changes from a hard glassy state into a soft rubbery state. The temperature at which the glass transition occurs is called the glass transition temperature.
[3] Solder balls
Solder is an alloy used to solder (join) metals such as electronic parts. Solder is used to anchor a semiconductor package or electronic part to a printed circuit board, at the same time keeping the terminals of each component electrically connected so that electrical signals can be exchanged between them. A solder ball is a spherical solder droplet pre-attached to the package for attachment of a single-side-sealed package, such as a ball grid array (BGA).

About Panasonic

Panasonic Corporation is a worldwide leader in the development of diverse electronics technologies and solutions for customers in the consumer electronics, housing, automotive, enterprise solutions and device industries. Since its founding in 1918, the company has expanded globally and now operates 474 subsidiaries and 94 associated companies worldwide, recording consolidated net sales of 7.553 trillion yen for the year ended March 31, 2016. Committed to pursuing new value through innovation across divisional lines, the company uses its technologies to create a better life and a better world for its customers. To learn more about Panasonic: http://www.panasonic.com/global.

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