Dexerials intends to use Thermoscale 200C not only for technical development and quality control within the company, but also for user support in various processes ranging from design to production. "Up until now, users needed a lot of experience and knowhow to measure temperatures at joints. So, we've had to put a lot of effort into putting measures in place to prevent defects from occurring at our customers' businesses. These defects would happen at the start of production, due to poor temperature control. Under these circumstances, our job has included briefing our customers on working methods and equipment design. The briefings had to take patterns of temperature changes during compression bonding into consideration. But with this Thermoscale, I think even novice engineers can easily get a clear picture of heat distribution problems, and our customers can prevent the kind of quality problems you often get during mass production from happening", said Mr. Saito.

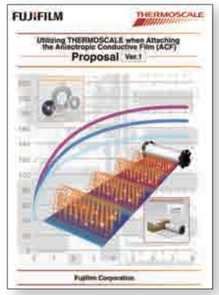
Thermoscale is also useful for quality control on production lines at plants using Dexerials products. "Temperature changes may occur at the start of an operation, when restarting work after a temporary shutdown, or when there's a change in the components that need to be mounted on a product, because of a change in configuration. By using Thermoscale 200C in these kinds of cases, we can quickly check heat distribution and so prevent defects from happening," said Mr. Saito.

As part of the initiative for utilizing Thermoscale 200C to reinforce user support, Dexerials and Fujifilm have jointly released "Proposal of Utilizing THERMOSCALE when Attaching the Anisotropic Conductive Film (ACF)"*, which summarizes the effective use of Thermoscale 200C. "Thermoscale is easy to use and provides a lot of information. It offers a lot of benefits to both materials suppliers like us and to users as well. We expect that as this tool finds wider use, our ACF products will win more consumer confidence and get used for a wider range of applications," said Mr. Saito.

* This article was featured on the website "Tech-On!" January 4 to February 28, 2013.

* "Proposal of Utilizing THERMOSCALE when Attaching the Anisotropic Conductive Film (ACF)" can be required to the authorized distributor.

* The Proposal contains sample colors developed on Thermoscale for different temperature profiles measured during actual ACF bonding work. (Data source: Dexerials Corporation)

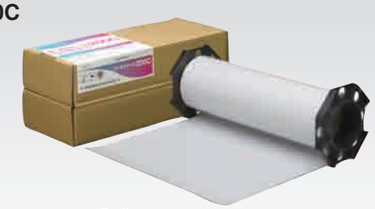


■ Specifications

Type	Service temperature range	Base	Thickness	Product size	
				Roll type (width × length)	Sheet type (height × width)
Thermoscale 200C	150°C to 210°C	PEN	0.09 mm	270 mm × 5 m	270 mm × 200 mm (5 sheets)

*Thermoscale's operational temperature range may vary depending on conditions of use (contact time, component materials, pressure, airflow, etc.).
*1: When the contact time is 5 to 20 seconds *2: When the contact time is 1 to 10 seconds

Thermoscale 200C



Roll type

Sheet type

FUJIFILM
Industrial Products Division, Fujifilm Corporation

Distributed by: Spare s.a.s.
Via Gen.le Enrico Maretti, 1/A-1 - 27057 Varzi - Pavia - Italy
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THERMOSCALE

Case example of product use

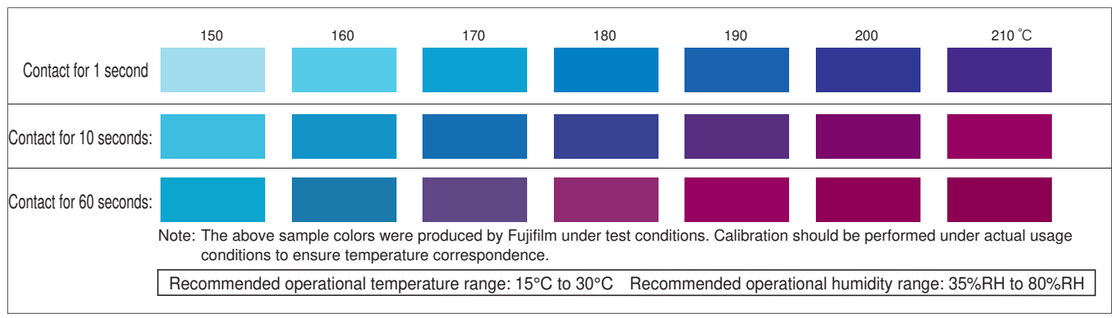
Fujifilm breaking new ground with its advanced technology "Thermoscale", the functional film that visualizes heat distribution on contact surfaces

Utilized as a Quality Control Tool for Joint Surfaces by Dexerials Corporation, the Leading Manufacturer of Anisotropic Conductive Film

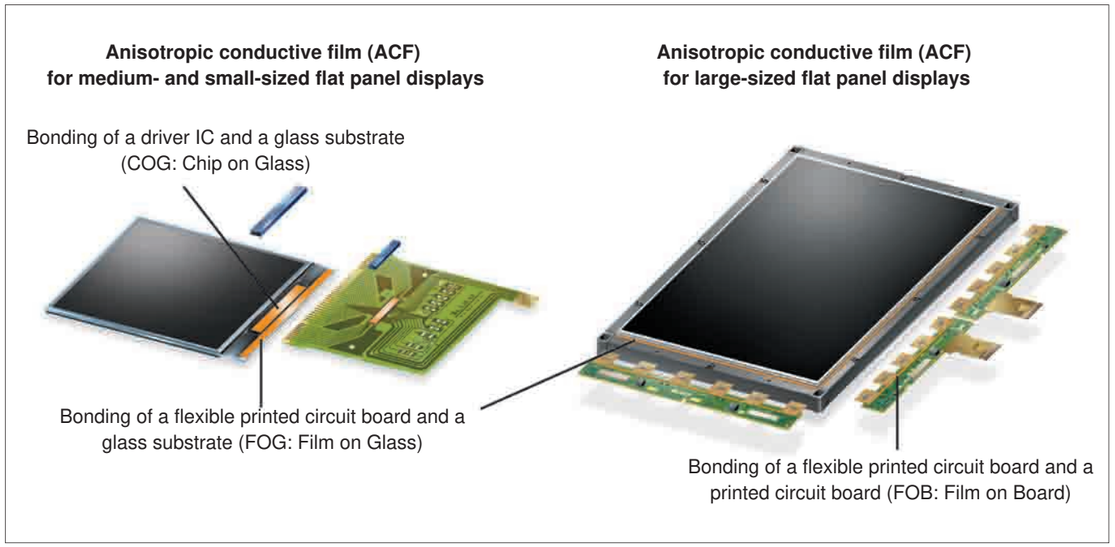
Mr. Masao Saito
Manager of the Product Development Department,
Advanced Material Division,
Dexerials Corporation

Fujifilm "Thermoscale 200C" is capable of instantaneously visualizing heat distribution on a planar surface. It has enabled observation of heat distribution on joint surfaces, which is difficult to achieve using conventional technologies. As such, it has been attracting attention in various fields since it was released in May 2012. Dexerials Corporation is among the first to introduce Thermoscale 200C as a quality-control tool. Dexerials manufactures functional materials and electronic components for electronic products. The corporation intends to improve product quality at its customers by using Thermoscale 200C to control the maximum conditions for bonding processes using anisotropic conductive film (ACF), which is key product for the corporation.

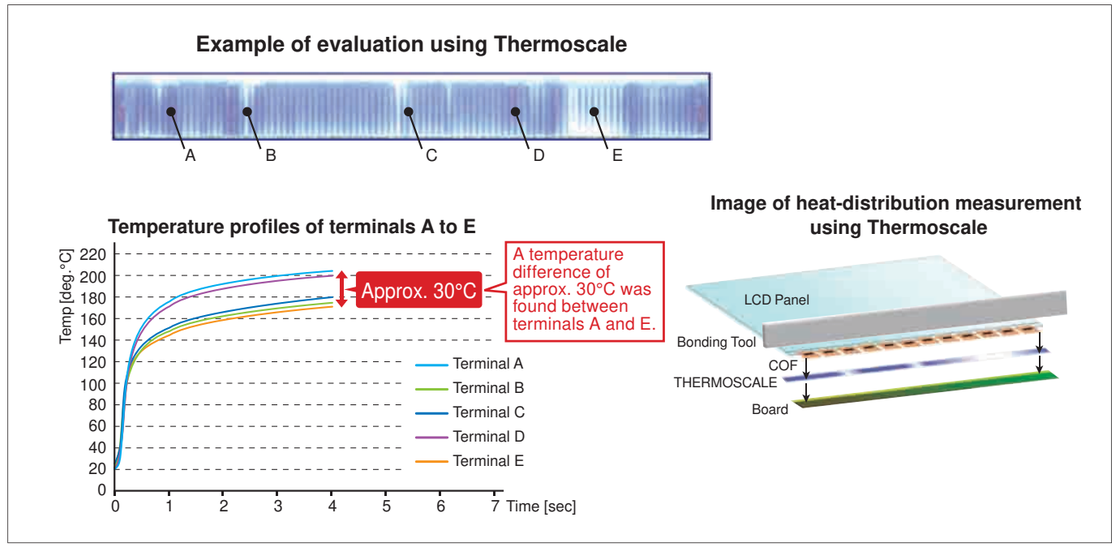
Thermoscale 200C is a thin film with a thickness of approx. 90 µm. When a heat source contacts one side of the film, the color of the film varies depending on the temperature of the heat source and the length of contact time (Figure 1). For example, the products currently available from Fujifilm are designed to react to temperatures of 150 to 210°C, and take on pale colors with a blue tint when the heat source temperature is approx. 150°C. As the temperature rises, the colors become deeper and take on a red tint. As the contact time increases (at the same temperature), the blue-tinted colors become deeper and the red-tinted colors become more reddish.



(Figure 1) Heat measurement film "Thermoscale"



(Figure 3) Examples of applications of anisotropic conductive films to COG mounting



(Figure 5) Results of temperature measurements using a thermocouple in heat distribution areas clarified by Thermoscale

With these characteristics, Thermoscale 200C has the great advantage of instantaneously visualizing heat distribution on a planar surface, using different shades of colors. Electronic thermometers using thermocouples can measure only temperatures at points, not across planes. To grasp heat distribution across a plane, it is necessary to take many measurements. With Thermoscale, you can observe heat distribution across a plane quickly in a single operation.

Materials essential for display-panel mounting processes

Dexerials Corporation is among the first to pay attention to this feature of Thermoscale 200C. It changed its corporate name from Sony Chemical & Information Device Corporation on September 28, 2012 and made a new start in October 2012. It particularly specializes in peripheral materials for flat panel displays for mobile equipment, such as smartphones and tablet terminals, televisions and other products, and produces anisotropic conductive film (ACF), optical elasticity resin (SVR), optical film, touchscreens, and other functional materials essential for digital home appliances.

Among these products, anisotropic conductive film (ACF) (Figure 2) has

(Figure 2) Anisotropic conductive film materials provided by Dexerials

achieved an outstanding reputation in the flat panel display and other electronics fields, making the corporation known as a leading supplier. "A mounting technology called COG (Chip on Glass) (Figure 3) is widely used for thin flat panel displays to be integrated in mobile equipment. It directly mounts LSI on a glass substrate. We have a large share of the market of anisotropic conductive films used for this COG technology," said Mr. Masao Saito, the Manager of the Product Development Department, Advanced Material Division, Dexerials Corporation. Thermoscale 200C is used for anisotropic conductive film (ACF), contributing to quality improvement.

Anisotropic conductive film (ACF) is a material in which conductive particles with surface insulation coating are evenly distributed in thermosetting resin to simultaneously allow for continuity, insulation and bonding – thereby collectively bonding many circuit electrodes on substrates. This material is used for almost all mounting processes for display panels and substrates.

Improving bonding quality through heat and pressure control

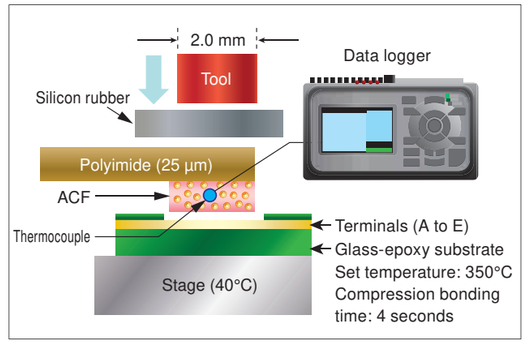
When an anisotropic conductive film (ACF) is used for bonding components, it is placed between the contact surfaces of the components and closely attached to them, and then heated and pressurized. When doing so, it is necessary to apply pressure evenly to the joint surfaces while maintaining the appropriate heat and pressure for a certain period of time. Failure to satisfy these requirements will result in poor bonding. "When using anisotropic conductive film, it's vital to properly control the heat, pressure and processing time. At Dexerials, we don't just offer materials to our customers – we also provide all kinds of technical support to help them to mount components properly. However, when anisotropic conductive film started being used for bonding, there really was no good way to measure pressures," said Mr. Saito.

As a tool for controlling bonding pressures, users of anisotropic conductive film (ACF) have been making use of the pressure-measurement film "Prescale", a long-selling product produced by Fujifilm since 1977. Like Thermoscale 200C, Prescale is a thin film, with a thickness of approx. 100 µm. Red patches appear when pressure is applied to the surface of Prescale. The higher the pressure becomes, the deeper the colors become. By utilizing this property, Prescale clarifies the pressure distribution in a joint surface instantaneously. "In addition to having Prescale as a tool to visualize pressure distribution, Thermoscale appeared as a tool to visualize heat distribution. This has enabled observation of both pressure and heat, making it easier to manage the required condition settings when using anisotropic conductive film," said Mr. Saito.

Providing at-a-glance visualization of heat distribution in a joint surface

Up to this point, it had been common to use thermocouples for measurement of heat distribution in joint surfaces with anisotropic conductive film (ACF). To be more precise, thin thermocouples with a thickness of several tens of micrometers were placed on a long contact surface to measure the temperature of the contact surface (Figure 4). "But it's impossible to take measurements at enough points to get a precise picture of heat distribution – especially on substrates for flat panel displays for liquid crystal televisions and other products where the length of one side can be as long as one meter. Thermocouples cannot measure heat distribution over the entire joint surface," said Mr. Saito. This issue can be resolved by using Thermoscale 200C in the form of a thin film. In short, heat distribution in a wider area can be observed quickly with a simple operation.

"When we actually measured heat distribution using Thermoscale 200C, we were able to find uneven heat distribution at a glance. We had been unable to visualize temperature distribution. So, we'd measure the temperature at only one point in the center of a component. Or we would take the opposite approach, and take measurements at so many points. However, with Thermoscale, we became able to get a precise picture of the lowest-temperature point by taking measurements at the point where the thermostat showed the smallest change in color. For example, when we used Thermoscale to measure heat distribution in a joint surface between a printed circuit board and a flexible printed circuit board with terminals of many different specifications, we found that uneven temperature distribution occurred near a grounding pattern with a large area, or a through hole and other patterns likely to release heat. This visual check has dramatically improved our analysis efficiency," said Mr. Saito. (Figure 5)



(Figure 4) How to check temperature differences in heat distribution