

## F-CO TM Sheet

Furukawa Electric has recently developed and brought into the marketplace "F-CO TM Sheet", a high-performance heat-conductive sheet that does not contain low molecular-weight siloxane.

The F-CO TM Sheet can be used to obtain a significant heat dissipation effect simply by inserting the sheet between a heat-generating electronic component and its cooling device.

### 1. HEAT-CONDUCTIVE SHEET

Many components for electronic equipment of these days tend to generate more heat accompanied by their improvement in performance, requiring heat-conductive sheets as one of the heat-dissipating measures. Conventional heat-conductive sheets were made of silicone materials mostly to provide good flexibility and high thermostability. These silicone materials, however, often caused problems such that low molecular-weight siloxane contained in the material was volatilized due to the high temperatures produced by heat-generating devices, subsequently adhering to the electrical contacts in the equipment such as motors, relays and switches, thereby producing silicon dioxide --an electrical insulator-- and eventually causing defective electrical contacts. Thus, it has long been desired that a siloxane-free heat-conductive sheet be developed that is provided with equivalent characteristics as for the silicone-based products in terms of flexibility and thermostability.

In response to such a requirement, Furukawa Electric has developed and brought into the marketplace F-CO TM Sheet, a non-silicone heat-conductive sheet, based mainly on acrylic rubber. At this time, the company has developed new types of heat-conductive sheets that are provided with a variety of functions.

### 2. TRENDS IN APPLICATION OF HEAT-CONDUCTIVE SHEET

The current situation with heat-conductive sheets is such that it is generally required to have not only higher heat conductivity to enable more efficient heat dissipation but also some functions other than heat conduction to add more values to the products.

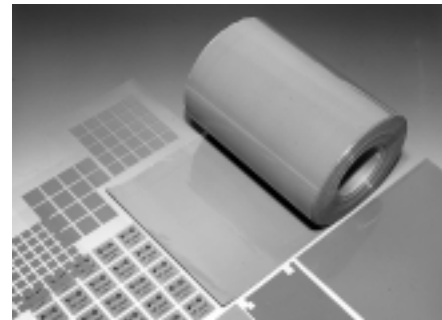


Photo 1 Appearance of F-CO TM Sheet.

#### 2.1 Electromagnetic Interference (EMI) Suppression Applications

Suppression of electromagnetic noise has become essential in many fields such as the next-generation mobile phone system as well as the intelligent transport system (ITS) that has recently begun implementation, and it is clear that these fields are growing both in number and in diversity. Furthermore, the proliferation of digital equipment is now influencing electromagnetic environments at homes and in offices, thus raising calls for effective countermeasures as electronic equipment continue to develop.

Two methods are known as such countermeasures: electromagnetic wave shielding technology where reflection by shielding materials is used to block the electromagnetic noise generated; and electromagnetic wave absorbing technology where electromagnetic noise is absorbed and ultimately converted into heat. The EMI suppression type of F-CO TM Sheet is based on the latter technology.

#### 2.2 High-adhesion Applications

Some digital equipment have grown in size recently. In such large-sized equipment, both of the heat-generating and heat-dissipating devices are large in size accordingly, necessitating closer contact between these devices to effect higher heat dissipation. This results in a demand for a heat-conductive sheet of high-adhesion type that is to be inserted between these devices.

In the case of compact equipment, on the other hand, heat-conductive sheets are often used like a double-faced tape without using fastening screws, thus requiring a heat-conductive sheet of high-adhesion type.

### 2.3 Low-hardness Applications

In the case of compact electronic equipment, there is a demand for a very soft, i.e., low-hardness heat-conductive sheet, in order to increase the area of close contact between the heat-generating and heat-dissipating devices to effect more efficient heat dissipation.

## 3. PRODUCT TYPES AND FEATURES OF F-CO TM SHEETS

In response to such trends described above, we have promoted the development of F-CO TM Sheet, so that the various types shown below are now available.

- Standard type
- High heat-conductivity type
- Thin-film composite type
- High withstand-voltage type
- EMI suppression type
- High-adhesion type
- Low-hardness type

Features common among these types are as follow:

- 1) Stabilized heat conductivity  
The products maintain, due to our proprietary technology of compounds, stabilized heat conductivity during long-term use.
- 2) Elimination of siloxane  
As mentioned at the beginning, the products are constituted of non-silicone rubber thus completely elimi-

nating concern about contact failures caused by volatilization of low molecular-weight siloxane.

### 3) Elimination of halogens

All types of F-CO TM Sheet do not contain any halogenous materials that may emit toxic gases. Regardless of this, certain types with high flame retardation are available.

Thus, all the products are environment-harmonized eliminating halogens, so that customers can feel assured in using them.

## 4. IN CONCLUSION

We intend to promote hereafter the development of F-CO TM Sheet in response to diversified customers' needs.

We are ready to offer our development proposals for any requirements concerning F-CO TM Sheet not covered in the description presented above. So, please feel free to contact the below mentioned.

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**Table 1 Characteristics of F-CO TM Sheet.**

Item	Type Product No.	Standard		High heat-conductivity EE	Thin-film composite	
		2014	N-500		Aluminum foil core A90/20-2	Double-faced A250/100-2
Thermal conductivity (W/mK)		1.6	1.6	2.5	1.4	1.4
Thermal resistance (°C/W)		0.57	0.31	0.50	0.13	0.31
Volume resistivity (Ω·cm)		1×10 <sup>12</sup>	2.7×10 <sup>12</sup>	1×10 <sup>12</sup>	/	/
Dielectric strength (kV/mm)		20	28	20	/	/
Flame retardance by UL94		V-0	/	V-0	/	/
30 % Compression strength (N/cm <sup>2</sup> )		84	27	80	/	/
Adhesion strength with Al (N/25 mm)		/	3.6	/	1.5	6.5

Item	Type Product No.	High withstand-voltage		EMI suppression	High-adhesion	Low-hardness
		Single-faced EN500/50-1	Double-faced EN500/50-2			
Thermal conductivity (W/mK)		1.6	1.6	2.0	0.6	1.1
Thermal resistance (°C/W)		0.35	0.28	0.55	1.2	0.8
Volume resistivity (Ω·cm)		2.5×10 <sup>11</sup>	3.9×10 <sup>11</sup>	1.0×10 <sup>10</sup>	8.0×10 <sup>14</sup>	2.4×10 <sup>14</sup>
Dielectric strength (kV/mm)		35	33	/	32	/
Flame retardance by UL94		HB	HB	V-0	V-1	V-0
30 % Compression strength (N/cm <sup>2</sup> )		130	100	80	/	10
Adhesion strength with Al (N/25 mm)		2.8	3.0	/	10	/