

Lineup Expansion of Non-Silicone Thermally Conductive Sheet “F-CO TM Sheet”

Furukawa Electric and F-CO have jointly developed and brought into the market F-CO TM Sheet —TM standing for Thermal Management—, which is high-performance thermally conductive sheet completely free from low molecular-weight siloxane. We have recently expanded the product lineup and upgraded the performance to meet the market needs.

1. THERMALLY CONDUCTIVE SHEET

As components for electronic equipment of recent date improve in performance, they tend to generate a higher amount of heat leading to increased demand for thermally conductive sheets as a means to dissipate the heat efficiently.

Conventional thermally conductive sheets mostly used silicone rubber materials for their plasticity and heat resistance. These silicone rubber materials, however, have been presenting problems such that low molecular-weight siloxane contained in the material volatilizes due to increased temperatures coming from the heat-generating devices, and subsequently adhere to electrical contacts in the equipment such as motors, relays and switches, thereby producing silicon dioxide —an electrical insulator— and eventually causing defective contacts.

Accordingly, there has been an increasing demand for a siloxane-free thermally conductive sheet with equivalent performance in terms of plasticity and heat conductivity.

In response to such a demand, we have developed and brought into the market F-CO TM Sheet, a series of high thermally conductive sheets based not on silicone rubber but on acrylic rubber. We have recently developed new types of F-CO TM Sheet with improved performance and workability, making available many types of the thermally conductive sheets suitable to varied applications.

2. TYPES OF F-CO TM SHEET

F-CO TM Sheet comes in various types aimed at more efficient heat dissipation such as: high-thermal conductivity type; upgraded type in terms of plasticity, workability or elasticity for reducing contact heat resistance; high-insulating type; and high-adhesion type. See Table 1.

2.1 Standard Type

The standard type of non-silicone, thermally conductive

F-CO TM Sheet is F-CO TM Sheet EE based on acrylic rubber. The standard thickness ranges from 0.5 mm to 4.0 mm. The product has acquired a UL94 V-0 certification.

2.2 High Thermally Conductive Type

Among the standard F-CO TM Sheet EE series based on acrylic rubber, F-CO TM Sheet EE-R is available, which is highly thermal conductive with a thermal conductivity of 3 W/m·K.

2.3 Elastic and Electric Insulating Type

Thermally conductive F-CO TM Sheet EP series based on ethylene-propylene rubber is available, which is low in hardness and is electrically insulating.

2.4 Thin Film Type

To reduce heat resistance as much as possible to achieve good heat conduction, it is no doubt the best way to make the sheet as thin as possible. Thin film type F-CO TM Sheet A90 consists of an aluminum foil with thermally conductive adhesive layers on the both faces. It features, in addition to the reduced heat resistance in the thickness direction thanks to the small thickness of 90 μm , a large heat diffusion coefficient in the plane taking advantage of good thermal conductivity of the aluminum foil.

2.5 General-Purpose and Elastic Type

In addition to the standard EE series, F-CO TM Sheet TP series is available, which is a new general-purpose type with low hardness and high elasticity. The TP series is based on thermoplastic elastomer, and is provided with rubber-like elasticity combined with good thermal conductivity.

Products with lower hardness are also available taking advantage of the proprietary compounding technology.

2.6 Others

F-CO TM Sheet PZ with strengthened adhesion is available. Its adhesion is about 5 to 10 times that of ordinary PVC adhesive tapes.

Self-adhesive F-CO TM Sheet JB with good resistance against low temperatures, high temperatures and chemicals is available.

F-CO TM Sheet EMI series is available, which is provided with good resistance against electromagnetic wave interference (EMI).

3. FEATURES OF F-CO TM SHEET

F-CO TM Sheet has the following features in common.

(1) Stable thermal conductivity

Stable thermal conductivity is maintained for a long period due to the proprietary compounding technology.

(2) Siloxane-free

Because it is based on non-silicone rubber, there is no danger of having contact faults caused by volatilization of light molecular-weight siloxane.

(3) Halogen-free

Whereas many types of the F-CO TM Sheet is provided with high flame retardance, all the products do not contain halogens whatever that may generate toxic gases.

4. CONCLUSION

We intend to promote hereafter the development of thermally conductive sheet in response to diversified customers' needs. We are ready to offer our development proposals for any requirements concerning thermally conductive sheets not covered in the description of the F-CO TM Sheet presented here. So, please feel free to contact us.

Table 1 Properties of F-CO TM Sheet.

Type	Standard/High-thermal conductive			Elastic & Electric insulating		
	Standard	High-thermal conductive	Low hardness	Standard	Low hardness	Ultra-low hardness
	EE	EE-R	EE-S	EP	EPS	SS
Thickness (mm)	Min. Max.	0.5 5	0.5 5	1.0 5	0.5 5	0.5 5
Thermal conductivity (W/m·K)		2.5	3.0	1.5	1.5	1.5
Volume resistivity (Ω cm)		1×10^{10}	1×10^{10}	1×10^{10}	1×10^{14}	1×10^{15}
Breakdown voltage (kV/cm)		10	10	10	15	15
Flame retardance (UL94)		V-0	V-0	V-0 equivalent	V-0	V-2 (0.5 mm~), V-0 (2.0 mm~)
Hardness (Asker C)		65	60	40	50	40 30
Adhesion (N/25mm)		1.5	0.3	0.5	0.3	0.3 1.5

Type	General-purpose & Elastic		High adhesion	Heat and chemical resistant	Thin film	EMI	
	Standard	Low hardness					
	TP	TP-SS					
Thickness (mm)	Min. Max.	0.3 5	0.3 5	0.5 2	0.5 —	0.09 —	0.5 5
Thermal conductivity (W/m·K)		2.5	1.5	0.6	0.8	1.4 in thickness >15 in plane	2.3
Volume resistivity (Ω cm)		1×10^{12}	1×10^{12}	1×10^{14}	1×10^{11}	1×10^{10}	1×10^{10}
Breakdown voltage (kV/cm)		10	10	30	30	2	2
Flame retardance (UL94)		V-0	V-0	V-2	V-0 equivalent	—	V-0
Hardness (Asker C)		50	30	50	30	—	60
Adhesion (N/25mm)		0.3	0.5	12.0	0.5	1.4	0.5

For more information, please contact:

Thermal and Antenna Solutions Dept., Electronics Components Div., Electronics and Automotive Systems Co.

TEL: +81-463-24-9784 FAX: +81-463-24-9786

or

R&D Div., F-CO

TEL: +81-463-21-4873 FAX: +81-463-21-5509