



KGK[®]

Start the new value creation
KGK Chemical Corp.

**Thermal
Conductive
Sheet
PRODUCT
GUIDE**

Japan Invention Awards

*Molecular gradient double tac tape

*May clean gel

Liquid crystal polymer film

What is thermal conductive sheet?

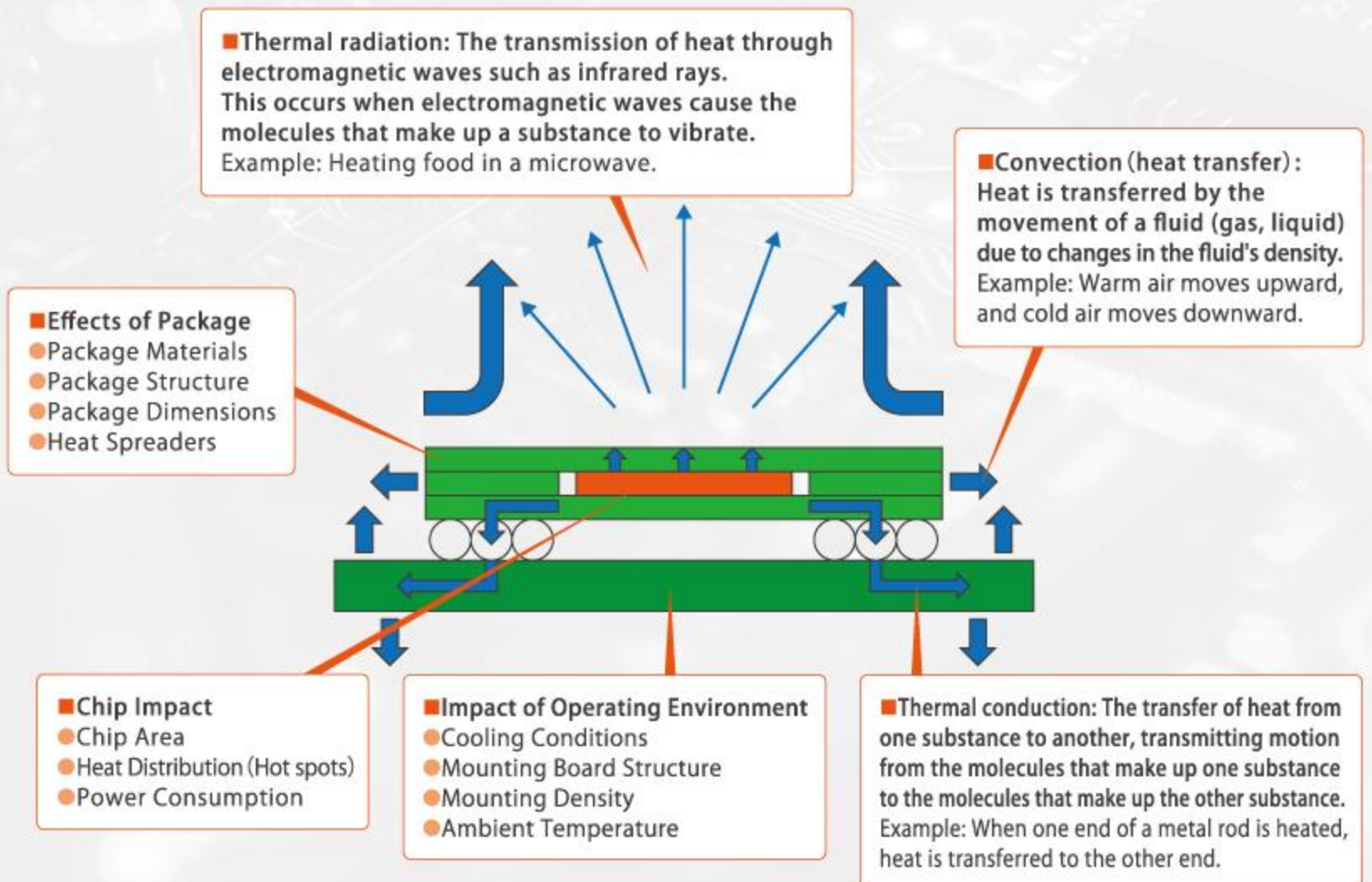


Thermal conductive sheet is a resin sheet with thermal conductivity.

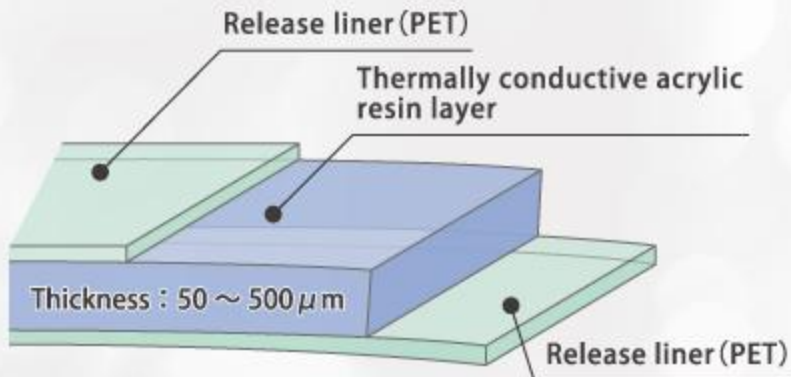
By incorporating a highly thermally conductive filler into a flexible resin sheet that is primarily made of acrylic or silicone resin, thermal conductivity is imparted to resin sheets that are not inherently thermally conductive.

By installing it in close contact with heat-generating components mounted on electronic devices, etc., it efficiently absorbs heat and releases it away from the heat-generating components, preventing malfunctions and breakdowns of the devices.

How heat is transferred



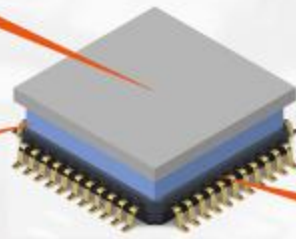
What is Tathaga ? High thermal conductive acryl gel



Polymer types	Acrylic composition
Filler types	Thermally conductive inorganic filler
Color	White
Release liner types	Silicone-treated PET

Cooling bodies such as metal plates and heat sinks

Thermal conductive sheet



Heat sources such as ICs and CPUs

【Features】

- Because it is non-silicone-based, there is no volatilization of siloxane, and it does not cause contact problems with electronic components or contaminate glass.
- It uses a filler with excellent filling properties and has high thermal conductivity.
- Excellent reworkability.
- Because it is a soft material, it can conform to even large uneven areas.
- Excellent adhesion reduces contact thermal resistance.
- It has excellent stress relaxation properties, which reduces the pressure on electronic elements after they are installed.
- It has excellent durability and maintains stable insulation and thermal conductivity even after long-term use.

【Applications】

- Prevents CPU from overheating.
- Heat dissipation measures for IC chips.
- LED heat dissipation.
- Improved heat dissipation characteristics of various connection parts.
- Heat dissipation for heat-generating components in electronic and electrical equipment. Heat generated by semiconductor products and other devices is efficiently transferred to heat dissipation components such as heat sinks and metal covers.

Lineup

Grade	Product	Thickness (μm)	Thermal conductivity (W/m·K)*1	Peel strength (N/25mm) SUS*2
General grade	KBS10	100	1.3	4
	KBS30	300	1.3	5
	KBS50	500	1.3	10
High thermal conductivity grade 1	HTAG10	100	3.0	3
	HTAG30	300	3.0	4
	HTAG50	500	3.0	8
High thermal conductivity grade 2 (Developed product)	200HTG100	100	10.0	0.1
	200HTG300	300	10.0	0.5
	200HTG500	500	10.0	0.7

*1 Laser Flash method *2 JIS Z 0237 compliant

Properties

Properties		Test method	Value	Unit
Mechanical properties	Tensile strength	JIS K 7162	1.3	MPa
	Elongation	JIS K 7162	420	%
Thermal properties	Thermal conductivity	Laser flash method	1.3	W/m·K
Electrical properties	Volume resistivity	DC250V印加	$\geq 10E15$	$\Omega \cdot \text{cm}$
	Dielectric breakdown voltage	AC	20	KV/mm
	Tracking resistance	CTI	600	V
Physical properties	Flame retardant	UL94 vertical burning test	Equivalent to V-0	-

Reliability test

① 90°C

Property		Unit	0h	100h	200h	500h	1000h	1500h
Hardness		AskerC	69	71	73	71	73	72
Thermal conductivity		W/mK	1.3	1.2	1.4	1.2	1.5	1.5
Mechanical properties	Tensile strength	MPa	1.3	1.1	1.2	1.3	1.3	1.1
	Elongation	(%)	420	390	310	330	390	420
Adhesive properties	No aluminum foil	N/25mm	4.7	7.8	8.3	7.9	5.3	8.3
	Aluminum foil included	N/25mm	5.2	17.0	12.0	11.0	21.0	28.0
Electrical properties	Dielectric breakdown voltage	(kV/mm)	20.6	20.3	21.6	19.1	20.5	18.9
Volume resistivity	100V	$\Omega \cdot \text{cm}$	>10E15	>10E15	>10E15	>10E15	>10E15	>10E15
	250V	$\Omega \cdot \text{cm}$	>10E15	>10E15	>10E15	>10E15	>10E15	>10E15
	500V	$\Omega \cdot \text{cm}$	>10E15	>10E15	>10E15	>10E15	>10E15	>10E15

② -40°C~120°C Thermal cycle test

Property		Unit	0h	200cyc.	400cyc.
Hardness		AskerC	69	72	73
Thermal conductivity		W/mK	1.3	1.4	1.5
Mechanical properties	100mm/min		1.3	1.2	1.4
			420	329	310
Adhesive properties	N/25mm		4.7	7.0	3.3
	N/25mm		5.2	16.6	19.6
Electrical properties	Dielectric breakdown voltage	kV/mm	20.6	16.5	17.7
Volume resistivity	100V	$\Omega \cdot \text{cm}$	>10E15	>10E15	>10E15
	250V	$\Omega \cdot \text{cm}$	>10E15	>10E15	>10E15
	500V	$\Omega \cdot \text{cm}$	>10E15	>10E15	>10E15

1. Contents

The changes in thermal conductivity of thermal sheets when stored under test conditions were evaluated.

2. Items

Specific gravity, hardness, thermal conductivity, mechanical properties, adhesive strength, electrical properties.

3. Environmental conditions

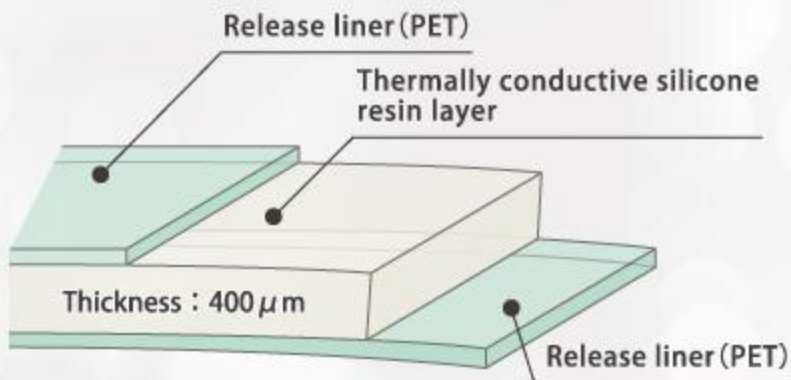
- ① 90°C
- ② -40°C~120°C Thermal cycle test

4. Results

Changes in various performance characteristics over time when placed in a specified environment.

※sample : KBS30

What is HTRG40 ? Heat-resistant thermal conductive gel sheet



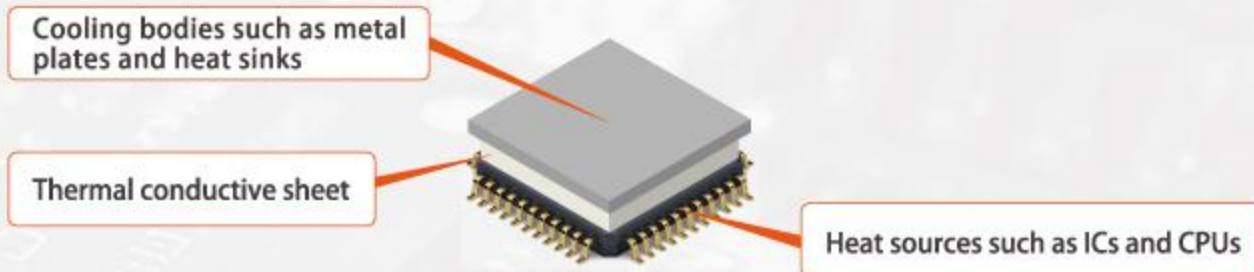
Polymer types	Silicone-based composition
Filler types	Thermally conductive inorganic filler
Color	White
Release liner types	Non-silicone-treated PET

【Features】

- It uses a filler with excellent filling properties and exhibits high thermal conductivity.
- Excellent heat resistance, allowing use in high temperature environments.
- It adheres well to materials that are difficult to adhere to, such as silicone rubber, and has excellent adhesion, reducing contact thermal resistance.
- It has excellent durability and maintains stable insulation and thermal conductivity even after long-term use.

【Applications】

- Heat dissipation from mounting boards for electronic devices, etc.
- Improved heat dissipation characteristics of various connections.
- Heat dissipation from heat-generating components in electronic and electrical devices.



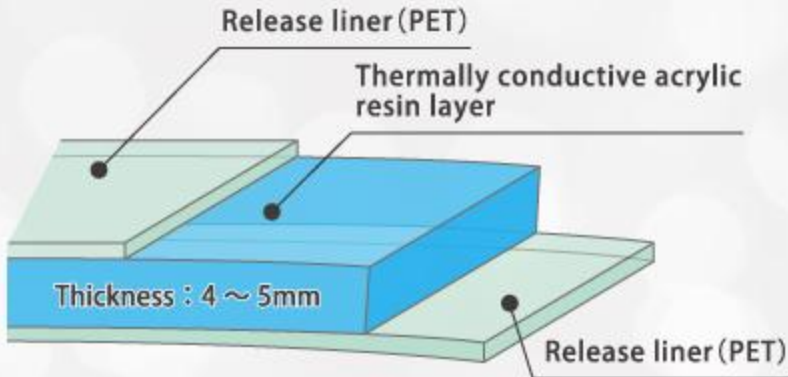
Lineup and properties

Product	Thickness (μm)	Thermal conductivity (W/m·K)*1	Peel strength (N/25mm) SUS*2
HTRG40	400	3	15

*1 Laser flash method, *2 JIS z 0237

Properties	Test method	Value	Unit	
Mechanical properties	Tensile strength	JIS K 7162	5.0	MPa
	Elongation	JIS K 7162	27	%
Thermal properties	Thermal conductivity	Laser flash method	3.0	W/m·K
Electrical properties	Volume resistivity	DC250V	≥ 10E8	Ω·cm
	Dielectric breakdown voltage	AC	13	KV/mm
Physical properties	Flame retardant	UL94 vertical burning test	Equivalent to V-0	-

What is the **KBS-YS series**? Low hardness thermal conductive gel sheet



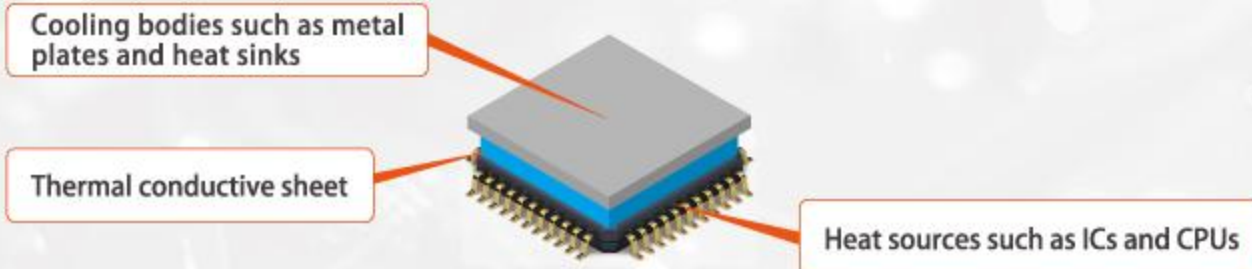
Polymer types	Acrylic composition
Filler type	Thermally conductive inorganic filler
Color	White
Release liner types	Silicone-treated PET

【Features】

- It has excellent flexibility and reduces adhesive thermal resistance at the mounting area, promoting heat dissipation.
- The stress relaxation properties of the thick film are utilized to reduce pressure on the built-in components.
- Excellent reworkability.
- It has flame retardancy equivalent to UL94 standard V-0.

【Applications】

- Heat dissipation for mounting boards of electronic devices, etc.
- Heat dissipation for automotive parts that require flame retardancy.
- Heat dissipation for heat-generating components in electronic and electrical equipment.



Lineup and properties

Product	Thickness (mm)	Thermal conductivity (W/m·K)*1	Peel strength (N/25mm) SUS*2	Low molecular weight siloxane content (μg/g)	Asker C hardness
KBS-YS400	4.0	2	1.2	500	10-20
KBS-YS500	5.0	2	1	500	10-20

*1 Laser flash method, *2 JIS z 0237

※ Test sample: KBS-YS500

Property		Test method	Value	Unit
Mechanical properties	Tensile strength	JIS K 7162	5.0	MPa
	Elongation	JIS K 7162	27	%
Thermal properties	Thermal conductivity	Laser flash method	2.0	W/m·K
Electrical properties	Volume resistivity	DC250V	≥ 10E9	Ω·cm
	Dielectric breakdown voltage	AC	40	KV/mm

Thermal conductivity measurement (Transient method)

Transient methods (laser flash method, hot wire method)

This method applies transient heat flow energy to a sample, reads the sample's temperature response, and calculates thermal conductivity. Thermal energy that changes over time is applied to the surface of the sample, and the temperature change on the back surface is measured to calculate thermal conductivity.

Thermal conductivity is a value specific to a material when the temperature is constant, and in a steady state, it follows Fourier's law, and the proportionality constant is the thermal conductivity.

thermal conductivity
 λ

$$Q = \lambda \frac{(T_1 - T_2)A}{L} \Rightarrow \lambda = \frac{Q}{A} \times \frac{L}{(T_1 - T_2)}$$

Q: Amount of heat transfer A: Cross-sectional area L: Heat transfer distance
T1: High temperature side temperature T2: Low temperature side temperature

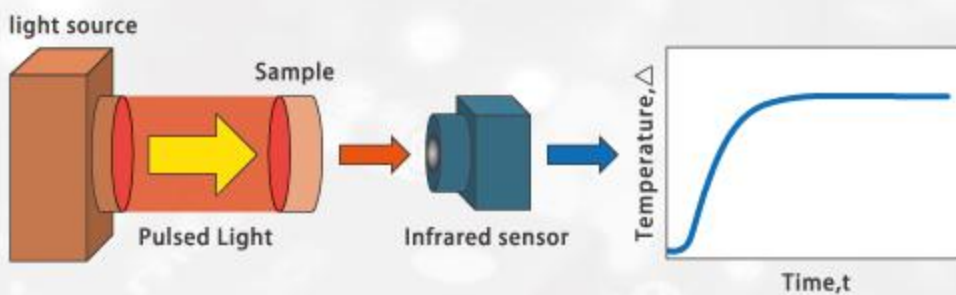
Thermal resistance is the sum of the resistance when heat Q flows between temperatures T1 and T2 and the contact resistance.

thermal resistance

$$R_0 = \frac{T_1 - T_2}{Q} = \frac{L}{\lambda A} \Rightarrow R = R_0 + R_s$$

RO: Material specific thermal resistance RS: Contact thermal resistance

Measurement flow



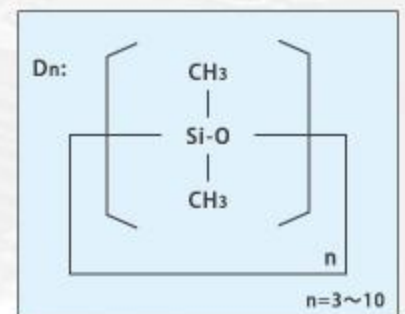
Adhesion test method/Adhesion



What are low molecular weight siloxanes?

Low molecular weight siloxanes

This refers to non-reactive cyclic dimethylpolysiloxanes (generally D3 to D10) represented by the chemical formula on the right. Due to their volatility, they evaporate into the atmosphere during and after curing. Low molecular weight siloxanes have been reported to cause electrical contact failure under the following specific conditions shown below.



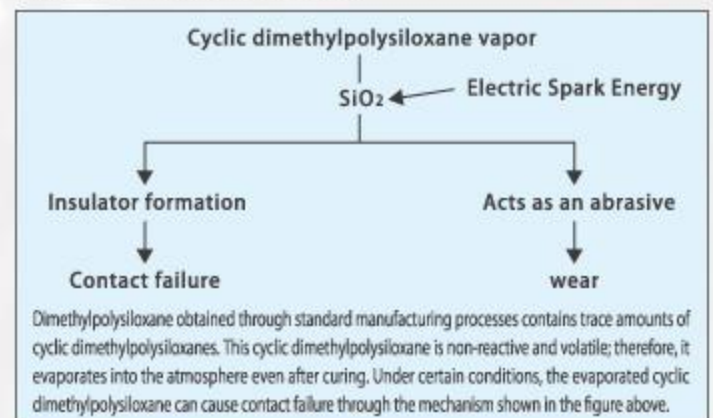
Electrical contact failure

Electrical contact failure can be caused by various substances. Human skin oils and organic gases such as organic solvents contribute to contact failure, while inorganic substances like hydrogen sulfide and ammonia gas are also known to cause similar issues. Furthermore, electrical and electronics manufacturers have reported that low molecular weight siloxanes can induce contact failure under specific low voltage and low current conditions.

Relationship between load conditions and contact reliability *Contact reliability under load (micro relay)

Load	Presence or absence of Si adhesion on the contact surface	Contact resistance
1 DC1V 1mA	None	No increase observed
2 DC1V 36mA	None	Some increase to several Ω
3 DC3.5V 1mA	None	No increase observed
4 DC5.6V 1mA	Adhesion	No increase observed
5 DC12V 1mA	Adhesion	Increases to several Ω , and even ∞ is seen
6 DC24V 1mA	Adhesion	Some numbers reach ∞ after about 1500 tries, and all reach ∞ after 3000 tries.
7 DC24V 35mA	Adhesion	Some numbers reach ∞ after about 3000 tries, and all reach ∞ after 4500 tries.
8 DC24V 100mA	Adhesion	No increase observed
9 DC24V 200mA	Adhesion	No increase observed
10 DC24V 1mA	Adhesion	No increase observed
11 DC24V 4mA	Adhesion	No increase observed

Mechanism of contact failure



Test Conditions Switching Frequency: 1Hz, Temperature: Room temperature, Contact Force: 13g / Source: Yoshimura, Y. and Ito, H., "EMC76-41," Technical Report of the Institute of Electronics, Information and Communication Engineers (IEICE), Feb. 18, 1977.

Caution

- The data in our catalog are examples of measurements from our tests and are not guaranteed values. In addition, the contents and specifications may be changed without notice.
- Please note that sales may be discontinued without notice.
- Customers are requested to confirm that the product is suitable for their intended use before using it.
- After thoroughly removing any oil, moisture, or dirt from the surface of the item to which you are applying the sticker, apply it without touching the adhesive surface as much as possible.
- Please be sure to check stock availability when placing your order.
- The recommended temperature for applying the tape is approximately 20° C.
- Be sure to apply sufficient pressure after applying the tape.
- There may be joints in the product.

Storage condition

Store the product indoors, avoiding condensation and direct sunlight. It is recommended that the products be stored stacked vertically under the following temperature and humidity conditions. temperature : 10~25°C humidity : 30~70%RH

Warranty

- Our company cannot control the process conditions of our customers (processing of our products, lamination conditions, and other conditions, if any). Therefore, please understand that we cannot guarantee the characteristics and quality that depend on each customer's process. The results described in our technical documents are based on actual data, but we do not guarantee that equivalent results will be obtained when used by individual customers.
- The seller's only obligation is to replace any product that proves to be defective and the seller shall not be liable for any injury or damage resulting from improper handling of the product. Before using, please check that it is suitable for your intended use.

Notes for safety

- When handling this product, there is a possibility that you may experience allergic symptoms such as skin irritation, rash, headache due to odor, or discomfort, which may vary from person to person. Therefore, please work in a well-ventilated environment or wear appropriate protective equipment such as gloves, a mask, and safety glasses.
- Some of our products are flammable. Please store and dispose of them in accordance with the law.
- If necessary, wear gloves to avoid cutting your hands on the edges of the film.
- Do not leave the removed separator on the floor as it is slippery.

 共同技研化学株式会社



■ Head office / Factory

Address: 940 Minaminagai Tokorozawa City Saitama pref 359-0011 Japan Phone: +81-4-2944-5151 FAX: +81-4-2944-1396

■ Tomioka Factory

Address: 1280 Okamoto Tomioka City Gunma pref 370-2321 Japan Phone: +81-274-70-2611 FAX: +81-274-70-2612

■ TOKYO Branch

Address: Ikebukuro Imaizumi Building Room 502 4-25-12 Higashi-Ikebukuro, Toshima-ku, Tokyo 170-0013 Japan
Phone: +81-3-5962-0915 FAX: +81-4-2944-1396

URL: <https://www.kgk-tape.co.jp> E-mail: info-k@kgk-tape.co.jp