

"PGS" Graphite Sheets

Type: EYG

"PGS (Pyrolytic Graphite Sheet)" is a ther mal interface which is very thin, synthetically made, has high thermal conductivity, and is made from a higly oriented graphite polymer film. It is ideal for providing thermal management/heat-sinking in limited spaces or to provide supplemental heat-sinking in addition to conventional means.

This material is flexible and can be cut into customizable shapes. SSM(Semi-Sealing Material) is the product which is compounding PGS Graphite sheet and High thermal conductive Elastomer resin. It has a function to absorb heat by resin and release the heat by utilizing high thermal conductivity of PGS Graphite sheet. It also enables taking better attachment to the component which has different height on theelectronic board, reducing stress to the electronic board.



Features

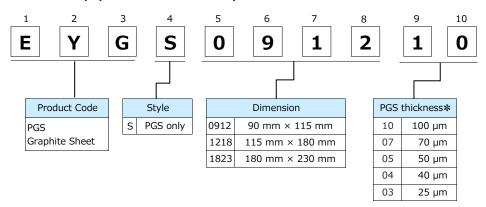
- Excellent thermal conductivity: 700 to 1950 W/(m⋅K)
 (2 to 5 times as high as copper, 3 to 8 time as high as aluminum)
- Lightweight: Specific gravity: 0.85 to 2.13 g/cm3 (1/4 to 1/10 of copper, 1/1.3 to 1/3 of aluminum in density)
- Flexible and easy to be cut or trimmed. (withstands repeated bending)
- Low thermal resistance
- Low heat resistance with fl exible Graphite sheet (SSM)
- Low repulsion and easy to keep the product's shape after attaching (SSM)
- Siloxane Free (SSM)
- High dielectric voltage: 17 kVac/mm (SSM)
- RoHS compliant

Recommended applications

- Smart phones, Mobile phones, DSC, DVC, Tablet PCs, PCs and peripherals, LED Devices
- Semiconductor manufacturing equipment (Sputtering, Dry etching, Steppers)
- Optical communications equipment

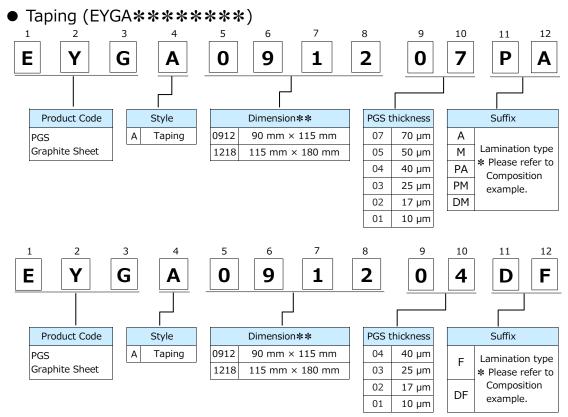
Explanation of Part Numbers

PGS only (EYGS******)



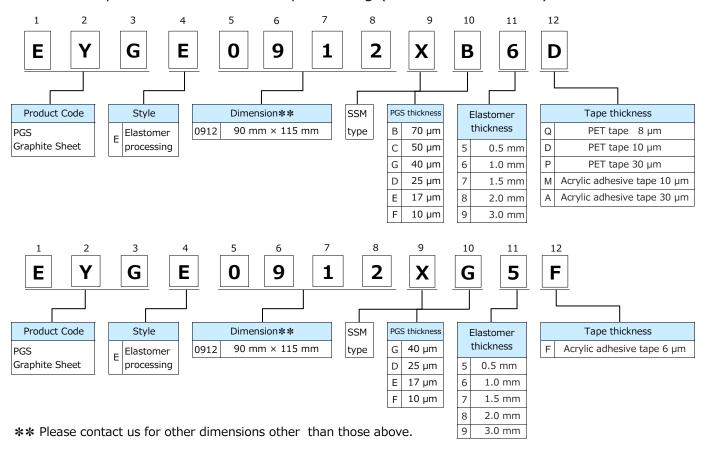
*PGS thickness of 17 μm, 10 μm does not than those above.

Explanation of Part Numbers



** Please contact us for other dimensions other than those above.

■ Thermally conductive elastomer processing (EYGE*********)





Characteristics of PGS Graphite Sheets

Thickness		100 μm	70 μm	50 μm	40 µm
		0.10±0.03 mm	0.07±0.015 mm	0.050±0 .015 mm	0.040±0 .012 mm
Density		0.85 g/cm ³	1.21 g/cm ³	1.70 g/cm ³	1.80 g/cm ³
Thermal conductivity	a-b plane	700 W/(m·K)	1000 W/(m⋅K)	1300 W/(m·K)	1350 W/(m·K)
Electrical conductivity		10000 S/cm	10000 S/cm	10000 S/cm	10000 S/cm
Extensional	strength	20.0 MPa	20.0 MPa	20.0 MPa	25.0 MPa
Expansion	a-b plane	9.3×10 ⁻⁷ 1/K	9.3×10 ⁻⁷ 1/K	9.3×10 ⁻⁷ 1/K	9.3×10 ⁻⁷ 1/K
coefficient	c axis	3.2×10 ⁻⁵ 1/K	3.2×10 ⁻⁵ 1/K	3.2×10 ⁻⁵ 1/K	3.2×10 ⁻⁵ 1/K
Heat resistance*		400 °C			
Bending(angle 180,R5)		10000 cycles			

Thickness		25 μm	17 μm	10 μm	
		0.025±0 .010 mm	0.017±0 .005 mm	0.010±0 .002 mm	
Density		1.90 g/cm ³	2.10 g/cm ³	2.13 g/cm ³	
Thermal conductivity a-b plane		1600 W/(m·K)	1850 W/(m⋅K)	1950 W/(m·K)	
Electrical conductivity		20000 S/cm	20000 S/cm	20000 S/cm	
Extensional	strength	30.0 MPa	40.0 MPa	40.0 MPa	
Expansion	a-b plane	9.3×10 ⁻⁷ 1/K	9.3×10 ⁻⁷ 1/K	9.3×10 ⁻⁷ 1/K	
coefficient	c axis	3.2×10 ⁻⁵ 1/K	3.2×10 ⁻⁵ 1/K	3.2×10 ⁻⁵ 1/K	
Heat resistance*		400 °C			
Bending(angle 180,R5)		10000 cycles			

^{*} Withstand temperature refers to PGS only. (Lamination material such as PET tape etc. is not included)

Characteristics of SSM (Elastomer)

Thickness		1 mm 2 mm 3 mm		3 mm		
Specifi c heat		1.4 J/(g·C)				
Density		1.88 g/cm ³				
Thermal cond	uctivity		1.6 W/(m·K)**			
Thermal	100 kPa	7.53 (C·cm ²)/W	14.82 (C·cm²)/W	19.48 (C·cm ²)/W		
resistance	200 kPa	6.71 (C·cm ²)/W	13.17 (C·cm ²)/W	16.01 (C·cm ²)/W		
resistance	300 kPa	5.90 (C·cm ²)/W	10.73 (C·cm ²)/W	11.38 (C·cm ²)/W		
	100 kPa	4.93 %	4.05 %	4.43 %		
Compressibility	200 kPa	9.58 %	8.66 %	14.04 %		
	300 kPa	18.41 %	22.13 %	40.49 %		
Resistivity		> 10×10 ¹⁴ Ω·cm				
Dielectric volta	age	> 17 kVac/mm				
Hardness (Type E)		39				
Adhasiya	SUS		39 mN/cm			
Adhesive force	Aluminum	31 mN/cm				
	Glass	38 mN/cm				

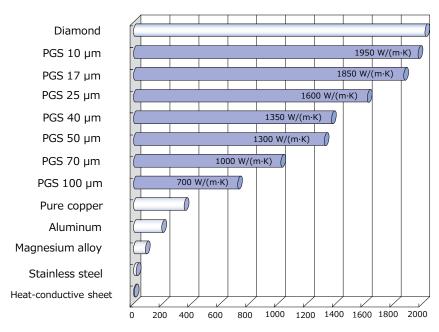
^{*} Characteristics refer to Elastomer resin only.

^{**} Values are for reference, not guaranteed.

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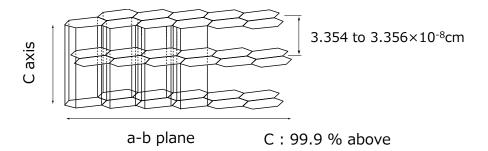


Comparison of thermal conductivity (a-b plane)

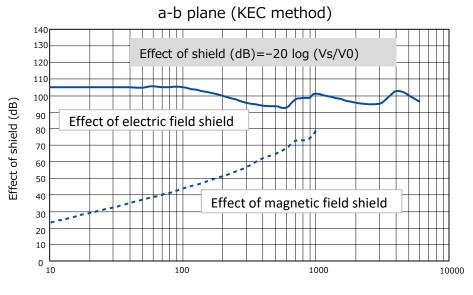


Coefficient of thermal conductivity $(W/(m \cdot k))$

Layered structure of PGS



Electric fi eld shield performance



Frequency (MHz)

Lamination type/Composition example

• Standard series (PGS 100, 70, 50, 40, 25, 17, 10 μm)

Typo		PGS Only		Adhesive Type	
	Type	S type	A – A type	A – M type	A – F type
Front face		-	-	-	-
Re	ar face	-	Insulative adhesive tape 30 µm	Insulative adhesive tape 10 µm	Insulative adhesive tape 6 µm
Structure		PGS Graphite Sheet	PGS Graphite Sheet	PGS Graphite Sheet	PGS Graphite Sheet
		suuduuuun	Acrylic Adhesive tape 30 µm	Acrylic Adhesive tape 10 µm	Acrylic Adhesive tape 6 µm
			Separating paper	Separating paper	Separating paper
		© High Thermal Conductivity High Flexibility	© With insulation material on one side	© With insulation material on one side	© With insulation material on one side
Features		© Low Thermal Resistance	© With strong adhesive	© Low thermal resistance	© Low thermal resistance
		Available up to 400 °C	tape for putting chassis	comparison with A-A type	comparison with A-A type
		© Conductive Material	© Withstanding Voltage : 2 kV	© Withstanding Voltage : 1 kV	
Withstand	d temperature	400 °C	100 °C	100 °C	100 °C
Standard	size	115 × 180 mm	90 × 115 mm	90 × 115 mm	90 × 115 mm
Maximum	n size	180 × 230 mm (25 μm ~)	115 × 180 mm	115 × 180 mm	115 × 180 mm
100 µm	Part No.	EYGS121810	-	-	-
100 μπ	Thickness	100 μm	-	-	-
70 µm	Part No.	EYGS121807	EYGA091207A	EYGA091207M	-
70 μπ	Thickness	70 µm	100 µm	80 µm	-
50 µm	Part No.	EYGS121805	EYGA091205A	EYGA091205M	-
30 μπ	Thickness	50 μm	80 µm	60 µm	-
40 um	Part No.	EYGS121804	EYGA091204A	EYGA091204M	EYGA091204F
40 µm Thickness		40 μm	70 μm	50 μm	46 μm
25 µm	Part No.	EYGS121803	EYGA091203A	EYGA091203M	EYGA091203F
	Thickness	25 μm	55 μm	35 μm	31 µm
17	Part No.	-	EYGA091202A	EYGA091202M	EYGA091202F
17 μm	Thickness	-	47 μm	27 μm	23 μm
10	Part No.	-	EYGA091201A	EYGA091201M	EYGA091201F
10 μm	Thickness	-	40 μm	20 μm	16 μm

^{*} Please contact us for other lamination type product.

^{**} Withstanding Voltages are for reference, not guaranteed.

Lamination type/Composition example

◆ Standard series (PGS 100, 70, 50, 40, 25, 17, 10 µm)

Type		Laminated type (Insulation & Adhesive)				
	Туре	A – PA type	A – PM type	A – DM type	A – DF type	
Fro	ont face	Polyester tape standard type 30 μm	Polyester tape standard type 30 μm	Polyester tape standard type10 μm	Polyester tape standard type 10 μm	
R€	ear face	Insulative adhesive tape 30 µm	Insulative adhesive tape 10 µm	Insulative adhesive tape 10 µm	Insulative adhesive tape $$ 6 μm	
Structure		PGS Polyester(PET) Graphite Sheet tape 30 µm Acrylic Adhesive tape 30 µm Separating paper	PGS Polyester(PET) Graphite Sheet tape 30 µm Acrylic Adhesive tape 10 µm Separating paper	PGS Polyester(PET) Graphite Sheet tape 10 µm Acrylic Adhesive tape 10 µm Separating paper	PGS Polyester(PET) tape 10 µm Acrylic Adhesive tape 6 µm Separating paper	
Features		With insulation material on one sideWithstanding Voltage PET tape: 4 kV Adhesive Tape: 2 kV	 With insulation material on one side Withstanding Voltage PET tape: 4 kV Adhesive Tape: 1 kV 	 With insulation material on one side Withstanding Voltage PET tape: 1 kV Adhesive Tape: 1 kV 	With insulation material on one sideWithstanding Voltage PET tape: 1 kV	
Withstand	d temperature	100 °C	100 °C	100 °C	100 °C	
Standard		90 × 115 mm	90 × 115 mm	90 × 115 mm	90 × 115 mm	
Maximum	n size	115 × 180 mm	115 × 180 mm	115 × 180 mm	115 × 180 mm	
100 um	Part No.	-	-	-	-	
100 µm	Thickness	=	=	=	-	
70 µm	Part No.	EYGA091207PA	EYGA091207PM	EYGA091207DM	-	
70 μπ	Thickness	130 µm	110 µm	90 μm	-	
50 µm	Part No.	EYGA091205PA	EYGA091205PM	EYGA091205DM	-	
30 μπ	Thickness	110 μm	90 μm	70 μm	-	
40	Part No.	EYGA091204PA	EYGA091204PM	EYGA091204DM	EYGA091204DF	
40 µm	Thickness	100 μm	80 µm	60 µm	56 μm	
25 µm	Part No.	EYGA091203PA	EYGA091203PM	EYGA091203DM	EYGA091203DF	
	Thickness	85 µm	65 μm	45 μm	41 µm	
17 µm	Part No.	EYGA091202PA	EYGA091202PM	EYGA091202DM	EYGA091202DF	
	Thickness	77 μm	57 μm	37 μm	33 μm	
10	Part No.	EYGA091201PA	EYGA091201PM	EYGA091201DM	EYGA091201DF	
10 µm	Thickness	70 μm	50 μm	30 μm	26 μm	

Please contact us for other lamination type product.

• Standard series (SSM)

Туре		E-6 type	E-8 type	E-9 type	
Elastomer thickness		1.0 mm	2.0 mm	3.0 mm	
Structure		PGS Polyester(PET) Graphite Sheet tape 10 µm	PGS Polyester(PET) Graphite Sheet tape 10 μm	PGS Polyester(PET) Graphite Sheet tape 10 µm	
		Acrylic Adhesive Elastomer 1.0 mm	Acrylic Adhesive Elastomer 2.0 mm	Acrylic Adhesive Elastomer 3.0 mm	
Features		 Soft and low thermal resistance (Elastomer) Low repulsion Withstanding Voltage: 1.7 kV 	 Soft and low thermal resistance (Elastomer) Low repulsion Withstanding Voltage: 1.7 kV 	 Soft and low thermal resistance (Elastomer) Low repulsion Withstanding Voltage: 1.7 kV 	
Withstand	d temperature	100 °C	100 °C	100 °C	
Standard size		90 × 115 mm	90 × 115 mm	90 × 115 mm	
70 um	Part No.	EYGE0912XB6D	EYGE0912XB8D	EYGE0912XB9D	
70 μm	Thickness	1.09 mm	2.09 mm	3.09 mm	
25 μm	Part No.	EYGE0912XD6D	EYGE0912XD8D	EYGE0912XD9D	
	Thickness	1.05 mm	2.05 mm	3.05 mm	

^{**} Withstanding Voltages are for reference, not guaranteed.

Minimum order

Item	Туре	Part No.	Size	Minimum orde
		EYGS091210	90×115 mm	20
	S type 100 µm	EYGS121810	115×180 mm	10
	100 μπ	EYGS182310	180×230 mm	10
	C born	EYGS091207	90×115 mm	20
	S type	EYGS121807	115×180 mm	10
	70 μm	EYGS182307	180×230 mm	10
	0.1	EYGS091205	90×115 mm	20
PGS Graphite Sheet	S type	EYGS121805	115×180 mm	10
Only	50 μm	EYGS182305	180×230 mm	10
	6.1	EYGS091204	90×115 mm	20
	S type	EYGS121804	115×180 mm	10
	40 µm	EYGS182304	180×230 mm	10
	0.1	EYGS091203	90×115 mm	20
	S type	EYGS121803	115×180 mm	10
	25 μm	EYGS182303	180×230 mm	10
	A – A type	EYGA091207A	90×115 mm	20
	70 µm	EYGA121807A	115×180 mm	10
	A – A type	EYGA091203A	90×115 mm	20
	25 µm	EYGA121803A	115×180 mm	10
	A – A type	EYGA091202A	90×115 mm	20
PGS 70, 25, 17 μm	17 µm	EYGA121802A	115×180 mm	10
Adhesive Type	A – M type	EYGA091207M	90×115 mm	20
[Standard series]	70 µm	EYGA121807M	115×180 mm	10
	A – M type	EYGA091203M	90×115 mm	20
	25 μm	EYGA121803M	115×180 mm	10
	A – M type	EYGA091202M	90×115 mm	20
	17 μm	EYGA121802M	115×180 mm	10
	A – PA type	EYGA091207PA	90×115 mm	20
	70 µm	EYGA121807PA	115×180 mm	10
	A – PA type	EYGA091203PA	90×115 mm	20
	25 μm	EYGA121803PA	115×180 mm	10
	A – PA type	EYGA091202PA	90×115 mm	20
	17 μm	EYGA121802PA	115×180 mm	10
	A – PM type	EYGA091207PM	90×115 mm	20
PGS 70, 25, 17 μm	70 µm	EYGA121807PM	115×180 mm	10
Laminated Type	A – PM type	EYGA091203PM	90×115 mm	20
(Insulation & Adhesive)	25 μm	EYGA121803PM	115×180 mm	10
[Standard series]	A – PM type	EYGA091202PM	90×115 mm	20
	17 μm	EYGA121802PM	115×180 mm	10
	A – DM type	EYGA091207DM	90×115 mm	20
	70 µm	EYGA121807DM	115×180 mm	10
	A – DM type	EYGA091203DM	90×115 mm	20
	25 μm	EYGA121803DM	115×180 mm	10
	A – DM type	EYGA091202DM	90×115 mm	20
	17 µm	EYGA121802DM	115×180 mm	10

⁽¹⁾ Only S type supports 180×230 mm size.

(PGS thickness of 17 μm, 10μm does not support as single item)

⁽²⁾ PGS of 10 μ m, 40 μ m, 50 μ m type is also possible to be made as lamination type.

⁽³⁾ The above-listed part number is sample part number for testing.

⁽⁴⁾ Please contact us about your request of custom part number which will be arranged separately.

⁽⁵⁾ Please contact us if quantity is below Minimum Order Quantity.

Minimum order

Item	Туре	Part No.	Size	Minimum order
	E - 9 type Elastomer 3.0 mm, PGS 70 µm	EYGE0912XB9D	90×115 mm	5
	E - 9 type Elastomer 3.0 mm, PGS 25 µm	EYGE0912XD9D	90×115 mm	5
SSM Elastomer	E – 8 type Elastomer 2.0 mm, PGS 70 μm	EYGE0912XD9D	90×115 mm	5
3.0, 2.0, 1.0 mm PGS 70, 25 µm	E - 8 type Elastomer 2.0 mm, PGS 25 µm	EYGE0912XD8D	90×115 mm	5
	E - 6 type Elastomer 1.0 mm, PGS 70 μm	EYGE0912XB6D	90×115 mm	5
	E - 6 type Elastomer 1.0 mm, PGS 25 µm	EYGE0912XD6D	90×115 mm	5

⁽¹⁾ Only S type supports 180×230 mm size. (PGS thickness of 17 μ m, 10 μ m does not support as single item)

- (2) PGS of 10 μ m, 40 μ m, 50 μ m type is also possible to be made as lamination type.
- (3) The above-listed part number is sample part number for testing.
- (4) Please contact us about your request of custom part number which will be arranged separately.
- (5) Please contact us if quantity is below Minimum Order Quantity.



Guidelines and precautions regarding the technical information and use of our products described in this online catalog.

- If you want to use our products described in this online catalog for applications requiring special qualities or reliability, or for applications where the failure or malfunction of the products may directly jeopardize human life or potentially cause personal injury (e.g. aircraft and aerospace equipment, traffic and transportation equipment, combustion equipment, medical equipment, accident prevention, anti-crime equipment, and/or safety equipment), it is necessary to verify whether the specifications of our products fit to such applications. Please ensure that you will ask and check with our inquiry desk as to whether the specifications of our products fit to such applications use before you use our products.
- The quality and performance of our products as described in this online catalog only apply to our products when used in isolation. Therefore, please ensure you evaluate and verify our products under the specific circumstances in which our products are assembled in your own products and in which our products will actually be used.
- If you use our products in equipment that requires a high degree of reliability, regardless of the application, it is recommended that you set up protection circuits and redundancy circuits in order to ensure safety of your equipment.
- The products and product specifications described in this online catalog are subject to change for improvement without prior notice. Therefore, please be sure to request and confirm the latest product specifications which explain the specifications of our products in detail, before you finalize the design of your applications, purchase, or use our products.
- The technical information in this online catalog provides examples of our products' typical operations and application circuits. We do not guarantee the non-infringement of third party's intellectual property rights and we do not grant any license, right, or interest in our intellectual property.
- If any of our products, product specifications and/or technical information in this online catalog is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially with regard to security and export control, shall be observed.

<Regarding the Certificate of Compliance with the EU RoHS Directive/REACH Regulations>

- The switchover date for compliance with the RoHS Directive/REACH Regulations varies depending on the part number or series of our products.
- When you use the inventory of our products for which it is unclear whether those products are compliant with the RoHS Directive/REACH Regulation, please select "Sales Inquiry" in the website inquiry form and contact us.

We do not take any responsibility for the use of our products outside the scope of the specifications, descriptions, guidelines and precautions described in this online catalog.

Precautions on the whole

- Do not use the products beyond the descriptions in this catalog.
- This catalog guarantees the quality of the products as individual components.

 Before you use the products, please make sure to check and evaluate the products in the circumstance where they are installed in your product.
- This product was designed and manufactured for standard applications such as general electronics devices, office equipment, information and communications equipment, measuring instruments, household appliances and audio-video equipment.
 - For applications in which special quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or cause threat of personal injury (such as for aircraft and aerospace equipment, traffic and transport equipment, combustion equipment, medical equipment, accident prevention and anti-theft devices, and safety equipment), please be sure to consult with our sales representative in advance and to exchange product catalog which conform to such applications.

Safety and Design considerations

- We are trying to improve the quality and the reliability, but the durability differs depending on the use environment and the use conditions. On use, be sure to confirm the actual product under the actual use conditions.
- Install the following systems for a failsafe design to ensure safety if these products are to be used in equipment where a defect in these products may cause the loss of human life or other signification damage, such as damage to vehicles (automobile, train, vessel), traffic lights, medical equipment, aerospace equipment, electric heating appliances, combustion/ gas equipment, rotating equipment, and disaster/crime prevention equipment.
 - •The system is equipped with a protection circuit and protection device.
 - •The system is equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault.
 - •The system is equipped with an arresting the spread of fire or preventing glitch.
- When a dogma shall be occurred about safety for this product, be sure to inform us rapidly, operate your technical examination.
- The temperature of this product at the time of use changes depending on mounting conditions and usage conditions, therefore, please confirm that the temperature of this product is the specified temperature after mounting it.
- This product does not take the use under the following special environments into consideration. Accordingly, the use in the following special environments, and such environmental conditions may affect the performance of the product; prior to use, verify the performance, reliability, etc. thoroughly.
 - 1) Use in liquids such as water, oil, chemical, and organic solvent.
 - 2) Use under direct sunlight, in outdoor or in dusty atmospheres.
 - 3) Use in places full of corrosive gases such as sea breeze, C₁₂, H₂S, NH₃, SO₂, and NO_X.
 - 4) Use the product in a contaminated state.
 - 5) Use in acid.
 - 6) Use outside the range defined by the operating temperature range.
 - 7) Use under reduced pressure or vacuum.

Precaution of installation

- Do not reuse this product after removal from the mounting board.
- Do not drop this product on the floor. If this product is dropped, it can be damaged mechanically. Avoid using the dropped product.
- This product is soft, do not rub or touch it with rough materials to avoid scratching it.
- Lines or folds in this product may affect thermal conductivity.
- Never touch a this product during use because it may be extremely hot.
- Use protective materials when handling and/or applying this product, do not use items with sharp edges as they might tear or puncture this product.
- Do not handle with bare hands as there is a concern about performance degradation.

Precaution on storage conditions

- Storage period is less than one year after our shipping inspection is completed. Please use within the period.
- If the product is stored in the following environments and conditions, the performance may be badly affected, avoid the storage in the following environments.
 - (1) Storage in places full of corrosive gases such as sea breeze, Cl₂, H₂S, NH₃, SO₂, and NO_X.
 - (2) Storage in places exposed to ultraviolet light.
 - *Recommended storage in the dark.
 - (3) Store at a temperature outside the storage temperature range specified by this catalog.
- In the case of a product configuration that assumes bonding, please use after checking the adhesiveness of the product when the storage period is over.

Precaution specific to this product

- This product has conductivity. If required, This product should be provided insulation.
- This product can not guarantee the insulation because there is a concern for powder falling off of conductive materials.
- Thermal conductivity is dependent on the way it is used. Test the adaptability of the product to your application before use.

Applicable laws and regulations, others

- No ODCs or other ozone-depleting substances which are subject to regulation under the Montreal Protocol are used in our manufacturing processes, including in the manufacture of this product.
- This product complies with the RoHS Directive (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (DIRECTIVE 2011/65/EU and (EU)2015/863) .
- All the materials used in this part are registered material under the Law Concerning the Examination and Regulation of Manufactures etc. of Chemical substances.
- If you need the notice by letter of "A preliminary judgment on the Laws of Japan foreign exchange and Foreign Trade control", be sure to let us know.
- These products are not dangerous goods on the transportation as identified by UN(United Nations) numbers or UN classification.
- As to the disposal of the module, check the method of disposal in each country or region where the modules are incorporated in your products to be used.
- The technical information in this catalog provides examples of our products typical operations and application circuits. We do not guarantee the non-infringement of third party's intellectual property rights and we do not grant any license, right, or interest in our intellectual property.