

Thermal Management Solutions



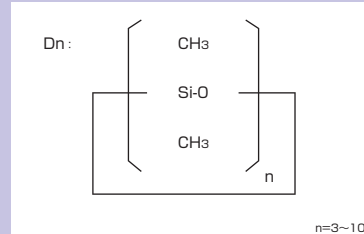
Low-molecular-weight siloxane

The number of dimethyl siloxane molecules in the sequence is often referred to as D3 (trimer), D4 (tetramer), or D5 (pentamer), and so on. The molecules up to D20 are called "low molecular weight cyclic siloxane". In particular, the total volume of D3 through D10 is used as a reference for the silicone's quality.

<Disadvantages>

The low-molecular-weight siloxane is highly volatile. It readily evaporates at room temperature, which results in the following problems.

- Electric contact failure: Electrically insulative silica is deposited on metal, resulting in contact failures.
- Adverse effect on optical equipment: Siloxane gas adversely affects optical instruments and devices



Thermal conductivity and thermal resistance

heat equation

Fourier's equation: $Q = \lambda \times ((\Delta T \cdot S) / d)$

Q: heat flow (W), λ : thermal conductivity (W / m · K), ΔT : temperature difference, S: cross sectional area of heat transfer area, d: distance

<Thermal Conductivity>

A measure of a material's ability to transfer heat

- The value of thermal conductivity does not change regardless of material size.
 - Decreasing the thickness of an object will decrease its temperature difference.
- λ (thermal conductivity) = $(Q \cdot d) / (\Delta T \cdot S)$ Where: $d / \Delta T = \text{constant}$

<Thermal Resistance>

Ability to resist flow of heat

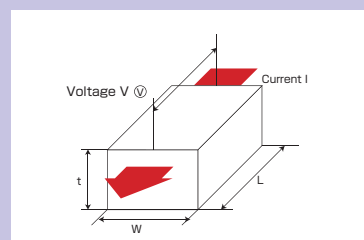
- Depending on distance of the heat source, area, and surface conformity, the resistance value of the same pad varies.
 - The resistance will be decreased when the area is wider; a higher thermal conductivity material is used; and the distance/ thickness to heat source is reduced.
- R_1 (thermal resistance): $^{\circ}\text{C} / \text{W} = d / (\lambda \cdot S)$

Volume resistivity (JIS K 6911 compliant)

Electrical resistance is generally used as a measure of conductivity (ease of electric conductance) of an object or material.

Resistance of a certain material per cubic unit (1 cm³) is referred as volume resistivity, which is a material property and is measured in [$\Omega \cdot \text{cm}$].

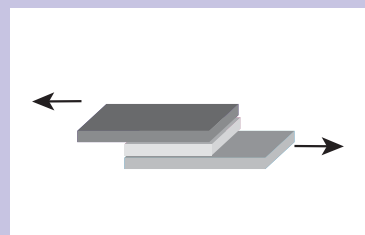
As shown in right diagram, the volume resistivity is calculated by measuring a voltage difference V(V) between two contacts across the cross section (t·W) generated by a constant current I (A) flow.



Tensile lap-shear strength (JIS K 6850: ISO 4587 and ISO 1995 equivalent)

The shear strength testing determines the shear strength of adhesives by applying tensile force to the specimen to pull it apart along the plane of adhesion until the breakdown of the adhesive layer occurs.

It is calculated by dividing the force required to shear the specimen by the area of the sheared area.



Product Lines

Heat spreader: heat dissipation parts



CERACOLD /CECD



HEAT SPREADER SHEET /HSD

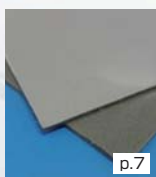
Thermal conductive material - silicone-free type



COOLPROVIDE™ /CPVH, CPVH



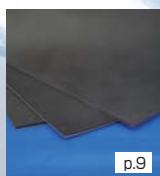
COOLPROVIDE™ /CPVS, CPVT



COOLPROVIDE™ /CPVP, CPSS



COOLPROVIDE™ /EMPV4, EMPV5



THERMAL DAMPER /CPAG

KGS
First Solution Proposer

Thermal conductive material - Silicone type



COOLPROVIDE™ /SPVS, SPV

Icons



Thermal & EMC Dual Functions

EMC absorption and thermal transfer management



High Thermal Conductivity(3W/m·K or higher)

High heat dissipation from ICs



Soft(ASKER C 15 or less)

For devices containing modules affected by pressure and compression



Phase-Change

Upon application high-viscosity gel-like material works as a gap-filler



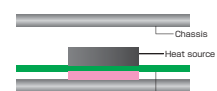
Vibration damping type

Vibration damping is performed simultaneously with high loss factor.

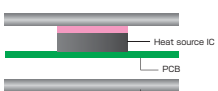
Applications



TIM used between heat source and heat sink



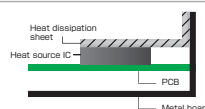
TIM used between heat source and metal chassis



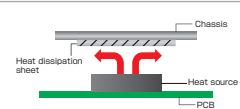
TIM used between heat source and metal chassis



TIM used between heat source and metal board



Heat spreader used for module where temperature difference is not permitted



Heat spreader used for chassis where heat remains

COOLPROVIDE™ / CPSH



P.5



Conductivity 5 W/m·K, Flexible thermally conductive sheet

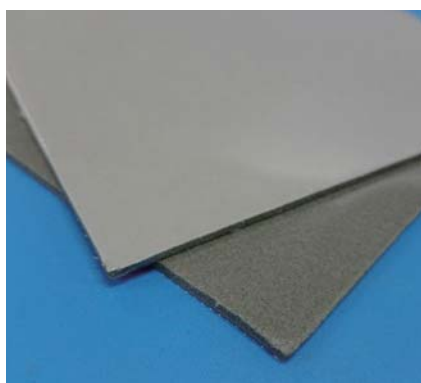
Features

- The sheet provides both high-thermal conductivity and flexibility. (Thermal conductivity: 5 W/m·K, Hardness: ASKER C 32)
- Flexible and excellent adhesion sheet lowers contact resistance.
- Silicone-free, no siloxane outgassing.
- Oil bleeding is reduced compared to silicone-based thermal materials.

COOLPROVIDE™ / CPVP



P.7



Ultra soft (ASKER C 0) Thermal Pad

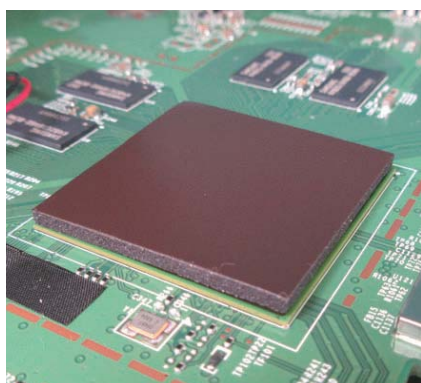
Features

- Super compliant (ASKER C 0) material minimizes thermal resistance.
- Compliant thermal pad with excellent compressive stress relaxation that reduces the load to heat element and PCB.
- Layered design for easy handling.
- Silicone-free, no siloxane outgassing.
- Oil bleeding is reduced compared to silicone-based thermal materials.

COOLPROVIDE™ / EMPV5



P.8



Thermal conductive sheet available for EMC noise suppression in broad frequency band from 500MHz to 3GHz.

Features

- Original composition is realized EMC noise suppression in broad band from 500MHz to 3GHz.
- Because of a non-silicon material, siloxane is not contained.
- Oil bleed is less, compared with silicone type.

Safety Guidelines

Please read before using this product.

1. The contents or products described in this catalog may change without notice due to product improvements and other reasons, or the supply may stop.
2. The data described in this catalog is not a guaranteed value
3. When exporting a product listed in this catalog, please check whether the cargo is subject to the regulation of "Foreign Exchange and Foreign Trade Law". In that case, the applicable export license is required. In addition, there are some countries and regions where a product is restricted for sale.
4. Any issues related to our intellectual property rights or third party's rights have occurred after the product in this catalog is used, our company does not assume the responsibility. In addition, it does not authorize the licensing of these rights.
5. The content of this catalog will apply only to the products you purchased from us or our authorized agencies. If no information is disclosed about the applicable conditions, or if the products were purchased from other third party, the conditions on the catalog will not apply.
6. The products described in this catalog might not be for sale by country or region.
7. The product listed in this catalog is meant to be used in general-purpose standard applications commonly found in general electronic devices/equipment (related to AV, office-use, computer-peripheral, communication, home appliance, industrial robot, entertainment, personal-use, measuring/test, etc.). It is intended to be used in a normal operation/method in such general electronic devices/equipment.

The scope of this catalog shall not be considered to guarantee the product's performance or quality, especially if it is planned to be used as a requirement in a high degree safety and reliability, or for an application where the device failure, malfunction, or misconduct may cause risk/harm to human life and body, or damages to a property, or may cause enormous impact to social conformance, as to such in the following applications (defined as specific applications). Please consult us before use in such cases whenever you require anything more than the product's normal performance range and conditions specified in the catalog, or if you have specific applications.

- ① aerospace equipment, ② transportation equipment (automobiles, trains, ships, etc.),
③ nuclear power related equipment, ④ medical equipment, ⑤ military equipment,
⑥ undersea/submarine equipment, ⑦ power generation control equipment,
⑧ highly public information processing equipment, ⑨ transportation control equipment,
⑩ electric heating equipment, combustion equipment, ⑪ disaster prevention, crime prevention equipment,
⑫ various safety devices, ⑬ other usage deemed to be specific applications,

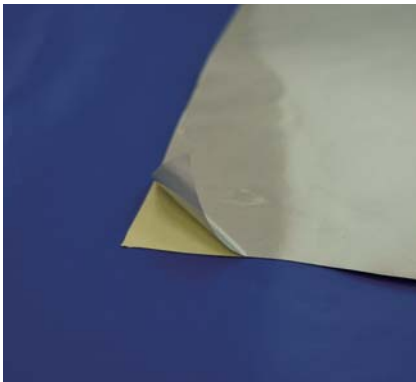
While designing the equipment to use the product in this catalog, please secure a protection or a backup in accordance with the intended use of the device.

8. We have taken all possible measures to improve the quality and reliability of the product, however, the wrong usage may cause personal injuries, fire accidents or social losses. Please consult us if you have any questions/concerns about the proper usage of our products.

Reprinting or copying the contents of this catalog without our permission is prohibited.

[Handling Instructions]

- Avoid touching heat element while installing — danger of burning when in contact.
- Ensure that the surface is free of dirt, dust, oil, or moisture before mounting.
- Do not remove protection film(Release liner,Release paper) until the time of use. It prevents debris and dust contamination.
- Product thickness shown on specification does not include protection film(Release liner,Release paper).
- Store in a cool and low-humidity place and avoid direct sunlight.
The phase-change gel must be stored below 35°C (Recommended temperature is 25°C).
- The product with self-tackiness may be difficult to peel after heating and compressing.

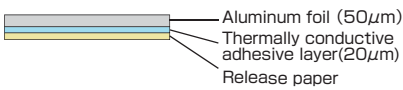


Thin and flexible heat spreading sheet for superior thermal management

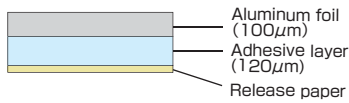
Features

- HSD has 221 W/m·K in thermal conductivity property which transfer heat in the X-Y axes.
- Flexible material suitable for uneven surfaces with various thicknesses available.
- Electrically insulating bonded layer (PET film, thermal conductive sheet) is available upon request.
- Ideal thermal solutions for hot spots on space conscious applications, such as mobile devices, tablet, and routers.

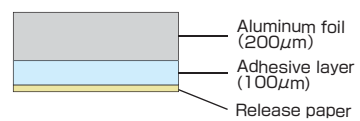
HSD-0.07



HSD-0.22



HSD-0.30

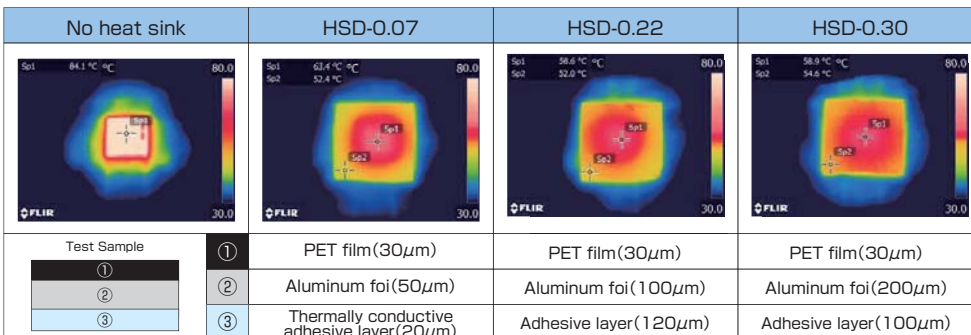


(The values below are not guaranteed.)

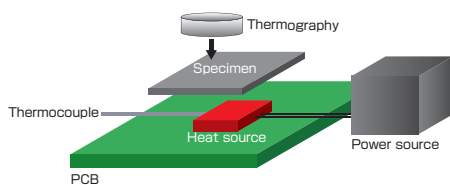
Test type	Unit	Standard	HSD-0.07	HSD-0.22	HSD-0.30
Surface Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)		221 (aluminum)	
Thickness	mm	—	0.07	0.22	0.30
Adhesion	N/25mm	JIS Z 0237:2009	>6	>16	>11
Flammability	—	UL94	UL510 FR equivalent	—	—
Operating temp	°C	—		-20~100	

Heat Dissipation Effect

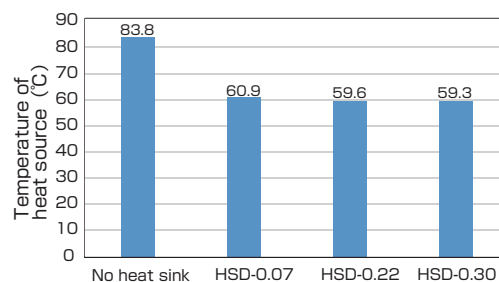
heat distribution



Testing method



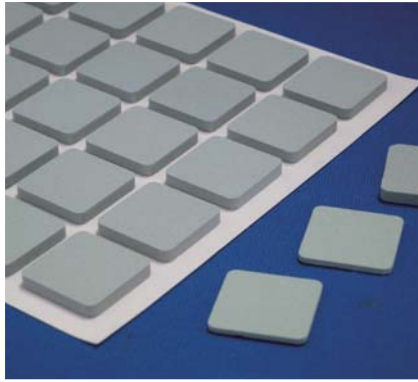
HSD Series Heat Dissipation Effect



<Test conditions>

Heat source : □25mm(1.5W)

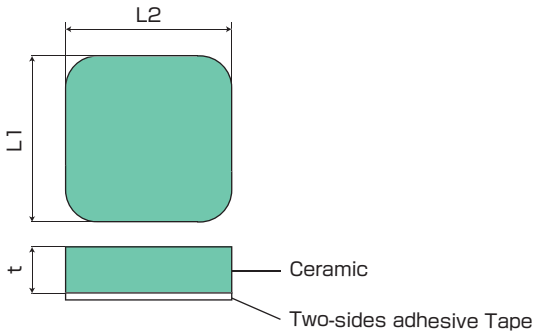
Specimen dimensions : □50mm



Porous ceramic-based heat sink for excellent insulation

Features

- Better thermal emissivity and heat dissipation is enhanced by a larger surface area of porous ceramic material compared to aluminum material.
- Lighter than aluminum heat sinks by approx.. 30%
- No electromagnetic radiation emitted from the heat sink unlike metal heat sinks.



(Unit:mm)

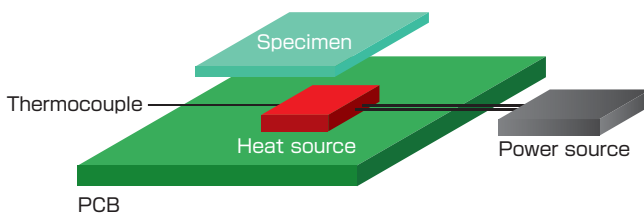
Part Number	Thickness:t	L1	L2
CECD-1.5-020020T	1.5	20	20
CECD-3.0-020020T	3.0	20	20
CECD-3.0-040040T	3.0	40	40

(The values below are not guaranteed.)

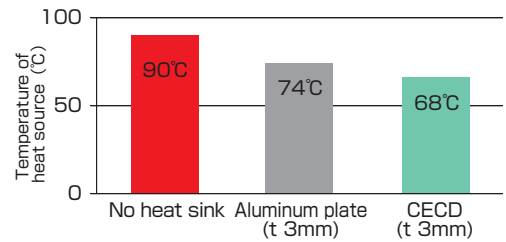
Test type	Unit	Standard	CECD
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	11.5
Color	—	—	Green
Specific Gravity	—	JIS Z 8807	1.95
Volume Resistivity	$\Omega \cdot \text{cm}$	JIS K 6911 compliant	$\geq 10^8$
Operating temp	$^{\circ}\text{C}$	—	-40~125

Heat dissipation efficiency

Heat conductive characteristics



Comparison of Heat Sink Efficiency



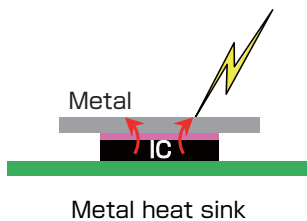
<Test conditions>

Heat source : □10mm(1.6W)

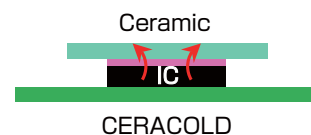
Specimen dimensions: □20mm(t3mm)

EMI noise issues with metal heat sink

Stray capacitance occurs between the IC chip (noise source) and the heat sink (not grounded), which becomes an antenna and emits radiated noise.



Since ceramic is an insulator, it is not affected by electrostatic coupling and does not act as an antenna to radiate noise.

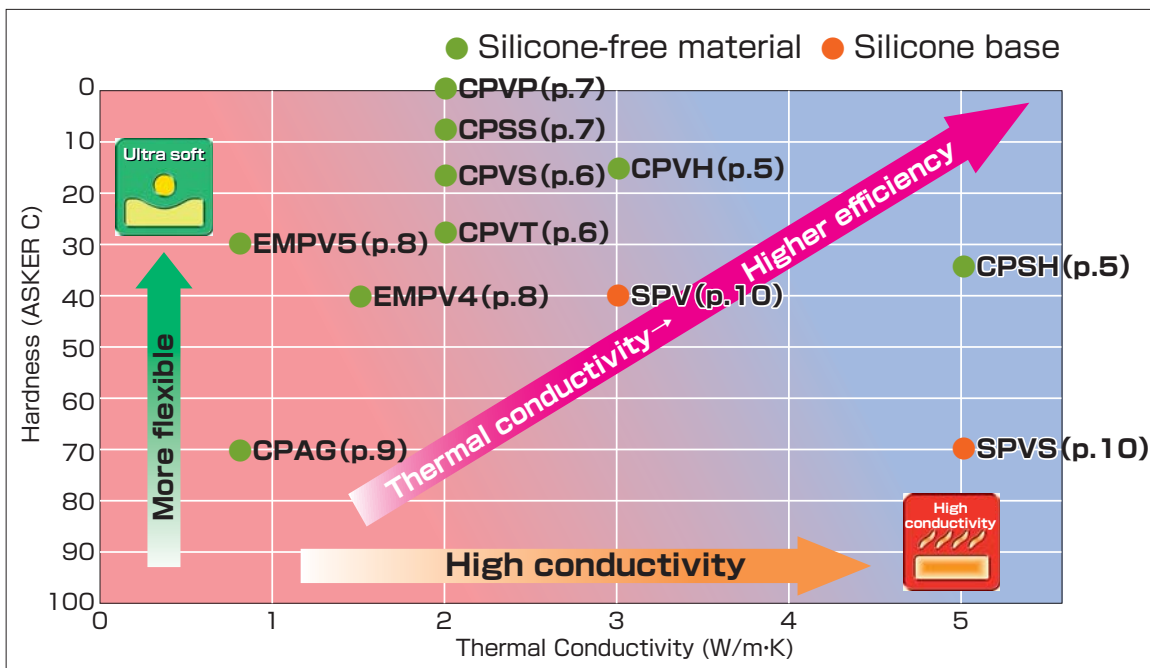


(The values below are not guaranteed.)

Test type	Unit	Standard	SPVS	SPV
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	5.0	3.0
		ISO22007-2 (Hot Disc method)	3.4	2.3
Color	—	—	Green	Green
Thickness	mm	—	0.5/1.0/1.5	0.5/1.0
Specific Gravity	—	JIS Z 8807	2.75	2.2
Hardness	ASKER C	JIS K 7312	70	40
	Shore 00	ASTM D 2240	86	69
Tensile strength	MPa	JIS K 6251	0.78	0.49
Elongation rate	%	JIS K 6251	46	160
Volume Resistivity	Ω·cm	JIS K 6911 compliant	3.0×10 ¹¹	2.0×10 ¹¹
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	3.2	0.69
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	1.8	0.3
Dielectric constant	1MHz	Company standard	13.7	35.1
Loss tangent	1MHz	Company standard	0.06	0.07
Flammability	—	UL94	V-0	V-1(t0.5mm)
Operating temp	°C	—	-20~125	-20~125
Available max. dimension*1	mm	—	210×510	210×510

※ 1) Please contact us for available pcs/sheet.

Characteristics comparison



※ CPVP is shown for super low hardness layer only

(The values below are not guaranteed.)

Test type	Unit	Standard	CPSH-F	CPSH	CPVH-F	CPVH
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	5.0	5.0	3.0	3.0
		ISO22007-2 (Hot Disc method)	3.7	3.7	2.2	2.2
Color	—	—	Light green	Light green	Brown	Brown
Thickness	mm	—	0.5/1.0/1.5/2.0 2.5/3.0/3.5/4.0	1.0/1.5/2.0 2.5/3.0/3.5/4.0	0.5/1.0/1.5/2.0 2.5/3.0/3.5/4.0	2.0/3.0/4.0
Specific Gravity	—	JIS Z 8807	2.89	2.89	2.33	2.33
Hardness	ASKER C	JIS K 7312	32*2	32	15	15
	Shore 00	ASTM D 2240	64	64	47	47
Tensile strength	MPa	JIS K 6251	0.37	0.21	0.25	0.15
Elongation rate	%	JIS K 6251	28	55	11	200
Volume Resistivity	Ω·cm	JIS K 6911 compliant	1.0×10 ¹¹	1.0×10 ¹¹	1.0×10 ¹¹	1.0×10 ¹¹
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	2.2	2.0	2.7	3.1
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	1.4	1.2	2.1	1.9
Dielectric constant	1MHz	Company standard	18.2	18.8	18.2	19.6
Loss tangent	1MHz	Company standard	0.01	0.01	0.08	0.08
Flammability	—	UL94	V-0	V-0 equivalent	V-0	V-0
Operating temp	°C	—	-40~125	-40~125	-40~125	-40~125
Available max. dimension*1	mm	—	210×510	210×510	210×510	210×510

(The values below are not guaranteed.)

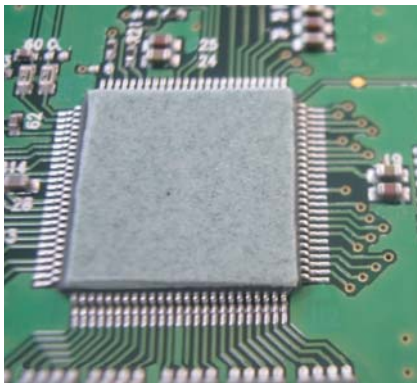
Test type	Unit	Standard	CPVS-F	CPVS	CPVT-F	CPVP-F
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	2.0	2.0	2.0	2.0
		ISO22007-2 (Hot Disc method)	1.5	1.5	—	1.4
Color	—	—	Green	Green	Green	Dark green/White
Thickness	mm	—	0.3/0.5/1.0 1.5/2.0/2.5	1.0/1.5/2.0/2.5	0.10/0.15 0.20/0.25	1.0/2.0/3.0 4.0/5.0/6.0
Specific Gravity	—	JIS Z 8807	1.94	1.94	1.94	—
Hardness	ASKER C	JIS K 7312	18	18	28	0(Super low hardness layer)
	Shore 00	ASTM D 2240	48	48	—	—
Tensile strength	MPa	JIS K 6251	0.32	0.16	4.38	—
Elongation rate	%	JIS K 6251	22	710	14	—
Volume Resistivity	Ω·cm	JIS K 6911 compliant	5.3×10 ¹¹	5.3×10 ¹¹	1.0×10 ¹³	1.0×10 ¹¹
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	4.3	3.9	11.1	—
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	2.8	2.2	5.0	—
Dielectric constant	1MHz	Company standard	12.1	14.4	6.69	—
Loss tangent	1MHz	Company standard	0.08	0.07	0.08	—
Flammability	—	UL94	V-2*3	V-2*3	—	V-0
Operating temp	°C	—	-40~100	-40~100	-20~100	-40~125
Available max. dimension*1	mm	—	210×510	210×510	210×510	210×510

(The values below are not guaranteed.)

Test type	Unit	Standard	CPSS-F	CPSS	EMPV4-F	EMPV5-F	CPAG-T	CPAG
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	2.0	2.0	1.5	—	0.8	0.8
		ISO22007-2 (Hot Disc method)	1.5	1.5	1.4	0.8	—	—
Color	—	—	Dark green	Dark green	Black	Black	Black	Black
Thickness	mm	—	1.0/1.5/2.0 2.5/3.0/4.0	4.0	1.0/1.5/2.0 2.5/3.0/3.5	1.0/1.5/2.0 2.5/3.0/3.5	0.5/1.0/2.0 3.0/4.0/5.0	0.5/1.0/2.0 3.0/4.0/5.0
Specific Gravity	—	JIS Z 8807	1.92	1.92	3.55	—	—	—
Hardness	ASKER C	JIS K 7312	8	8	40	30	70	70
	Shore 00	ASTM D 2240	33	33	70	60	Durometer typeA 64*4	Durometer typeA 64*4
Tensile strength	MPa	JIS K 6251	0.28	—	0.51	—	—	—
Elongation rate	%	JIS K 6251	25	—	44	—	—	—
Volume Resistivity	Ω·cm	JIS K 6911 compliant	1.0×10 ¹²	1.0×10 ¹²	1.0×10 ¹²	1.0×10 ¹¹	5.54×10 ¹¹	5.54×10 ¹¹
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	3.5	—	6.0	8.8	—	—
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	2.8	—	4.2	5.0	—	—
Dielectric constant	1MHz	Company standard	14.6	—	12.7	—	—	—
Loss tangent	1MHz	Company standard	0.09	—	0.13	—	—	—
Flammability	—	UL94	V-2(t1.0 - 3.0mm) V-0(t4.0mm)	—	V-0 equivalent	V-0 equivalent	—	V-1 equivalent(t2.0mm) V-0 equivalent(t3.0 - 5.0mm)
Operating temp	°C	—	-40~100	-40~100	-40~110	-40~110	-10~100	-10~100
Available max. dimension*1	mm	—	210×510	210×510	210×510	210×510	340×340	350×350

*1) Please contact us for available pcs/sheet. *2) 0.5F : ASKER C 55 *3) t0.5-2.0mm *4) JIS K 6253compliant

COOLPROVIDE™ / CPVS



Soft (ASKER C 18), thermal pad with high damping characteristics (loss factor 0.9)

Features

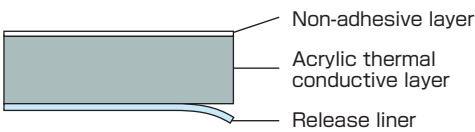
- Excellent vibration control. (loss factor 0.9)
- Super compliant (ASKER C 18) material minimizes thermal resistance.
- Compliant thermal pad with excellent compressive stress relaxation that reduces the load to heat element and PCB.
- Silicone-free, no siloxane outgassing.
- Oil bleeding is reduced compared to silicone-based thermal materials.

(The values below are not guaranteed.)

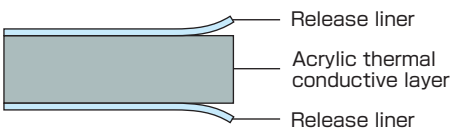
Test type	Unit	Standard	CPVS-F	CPVS
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	2.0	2.0
		ISO22007-2 (Hot Disc method)	1.5	1.5
Color	—	—	Green	Green
Thickness	mm	—	0.3/0.5/1.0	1.0/1.5
			1.5/2.0/2.5	2.0/2.5
Specific Gravity	—	JIS Z 8807	1.94	1.94
Hardness	ASKER C	JIS K 7312	18	18
	Shore 00	ASTM D 2240	48	48
Tensile strength	MPa	JIS K 6251	0.32	0.16
Elongation rate	%	JIS K 6251	22	710
Volume Resistivity	Ω·cm	JIS K 6911 compliant	5.3×10 ¹¹	5.3×10 ¹¹
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	4.3	3.9
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	2.8	2.2
Dielectric constant	1MHz	Company standard	12.1	14.4
Loss tangent	1MHz	Company standard	0.08	0.07
Flammability	—	UL94	V-2*2	V-2*2
Loss Factor	—	Measured by FWHM method	0.9	0.9
Operating temp	°C	—	-40~100	-40~100
Available max. dimension.*1	mm	—	210×510	210×510

*1) Please contact us for available pcs/sheet.
*2)t0.5-2.0mm

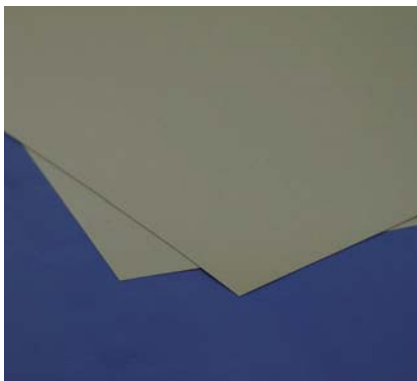
One-side tacky type / CPVS-F



Both-side tacky type / CPVS



COOLPROVIDE™ / CPVT



Ultra thin thermal sheet is suitable for limited gap space such as in mobile applications.

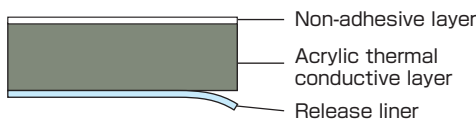
Features

- Thickness ranging from 0.1mm~0.25mm at 0.05mm pitch minimizes PCB load.
- Self-tacky sheet provides easy workability compared to grease application.
- Super compliant (ASKER C 28) material minimizes thermal resistance.
- Silicone-free, no siloxane outgassing.
- Oil bleeding is reduced compared to silicone-based thermal materials.

(The values below are not guaranteed.)

Test type	Unit	Standard	CPVT-F
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	2.0
		ISO22007-2 (Hot Disc method)	—
Color	—	—	Green
Thickness	mm	—	0.10/0.15
			0.20/0.25
Specific Gravity	—	JIS Z 8807	1.94
Hardness	ASKER C	JIS K 7312	28
	Shore 00	ASTM D 2240	—
Tensile strength	MPa	JIS K 6251	4.38
Elongation rate	%	JIS K 6251	14
Volume Resistivity	Ω·cm	JIS K 6911 compliant	1.0×10 ¹³
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	11.1
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	5.0
Dielectric constant	1MHz	Company standard	6.69
Loss tangent	1MHz	Company standard	0.08
Flammability	—	UL94	—
Operating temp	°C	—	-20~100
Available max. dimension.*1	mm	—	210×510

*1) Please contact us for available pcs/sheet.



COOLPROVIDE™ / CPSH



Conductivity 5 W/m·K, Flexible thermally conductive sheet

Features

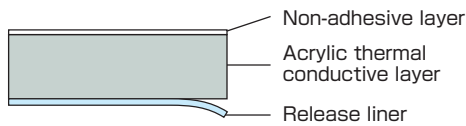
- The sheet provides both high-thermal conductivity and flexibility. (Thermal conductivity: 5 W/m·K, Hardness: ASKER C 32)
- Flexible and excellent adhesion sheet lowers contact resistance.
- Silicone-free, no siloxane outgassing.
- Oil bleeding is reduced compared to e-based thermal materials.

(The values below are not guaranteed.)

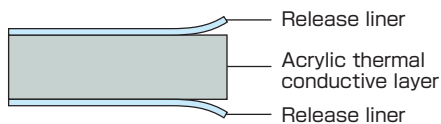
Test type	Unit	Standard	CPSH-F	CPSH
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	5.0	5.0
		ISO22007-2 (Hot Disc method)	3.7	3.7
Color	—	—	Light green	Light green
Thickness	mm	—	1.0/1.5/2.0	1.0/1.5/2.0
			2.5/3.0/3.5/4.0	2.5/3.0/3.5/4.0
Specific Gravity	—	JIS Z 8807	2.89	2.89
Hardness	ASKER C	JIS K 7312	32	32
		Shore 00 ASTM D 2240	64	64
Tensile strength	MPa	JIS K 6251	0.37	0.21
Elongation rate	%	JIS K 6251	28	55
Volume Resistivity	Ω·cm	JIS K 6911 compliant	1.0×10 ¹¹	1.0×10 ¹¹
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	2.2	2.0
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	1.4	1.2
Dielectric constant	1 MHz	Company standard	18.2	18.8
Loss tangent	1 MHz	Company standard	0.01	0.01
Flammability	—	UL94	V-0	V-0 equivalent
Operating temp	°C	—	-40~125	-40~125
Available max. dimension ^{※1}	mm	—	210×510	210×510

※ 1) Please contact us for available pcs/sheet.

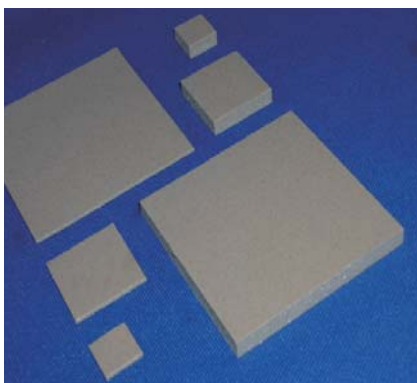
One-side tacky type / CPSH-F



Both-side tacky type / CPSH



COOLPROVIDE™ / CPVH



3W/m·K thermal pad (ASKER C 15) for high operating temperature applications

Features

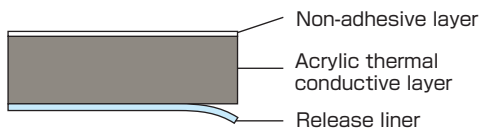
- Super compliant (ASKER C 15) material minimizes thermal resistance.
- Compliant thermal pad with excellent compressive stress relaxation that reduces the load to heat element and PCB.
- Silicone-free, no siloxane outgassing.
- Oil bleeding is reduced compared to silicone-based thermal materials.

(The values below are not guaranteed.)

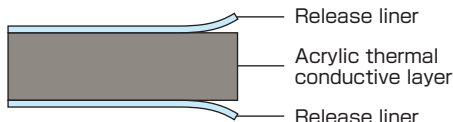
Test type	Unit	Standard	CPVH-F	CPVH
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	3.0	3.0
		ISO22007-2 (Hot Disc method)	2.2	2.2
Color	—	—	Brown	Brown
Thickness	mm	—	0.5/1.0/1.5/2.0	2.0/3.0/4.0
			2.5/3.0/3.5/4.0	
Specific Gravity	—	JIS Z 8807	2.33	2.33
Hardness	ASKER C	JIS K 7312	15	15
		Shore 00 ASTM D 2240	47	47
Tensile strength	MPa	JIS K 6251	0.25	0.15
Elongation rate	%	JIS K 6251	11	200
Volume Resistivity	Ω·cm	JIS K 6911 compliant	1.0×10 ¹¹	1.0×10 ¹¹
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	2.7	3.1
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	2.1	1.9
Dielectric constant	1 MHz	Company standard	18.2	19.6
Loss tangent	1 MHz	Company standard	0.08	0.08
Flammability	—	UL94	V-0	V-0
Operating temp	°C	—	-40~125	-40~125
Available max. dimension ^{※1}	mm	—	210×510	210×510

※ 1) Please contact us for available pcs/sheet.

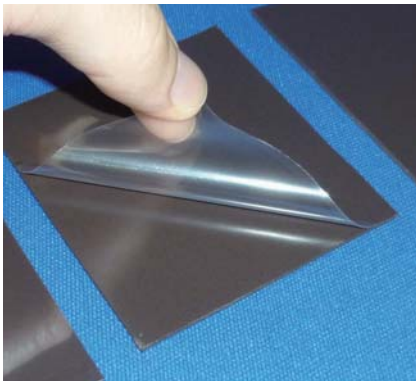
One-side tacky type / CPVH-F



Both-side tacky type / CPVH



COOLPROVIDE™/ EMPV4



Thermal Interface Material with High Permeability ($\mu' = 13$)

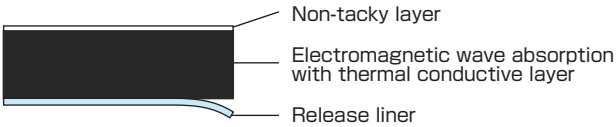
Features

- Excellent EMI absorber performance ($\mu' = 13$) and compliant thermal material (ASKER C 40).
- Have excellent adhesion, performs heat conduction and MHz~GHz range electromagnetic wave attenuation simultaneously.
- Silicone-free, no siloxane outgassing.
- Oil bleeding is reduced compared to silicone-based thermal materials.

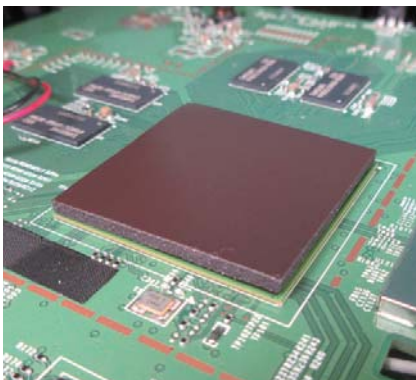
(The values below are not guaranteed.)

Test type	Unit	Standard	EMPV4-F
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	1.5
		ISO22007-2 (Hot Disc method)	1.4
Color	—	—	Black
Thickness	mm	—	1.0/1.5/2.0 2.5/3.0/3.5
Specific Gravity	—	JIS Z 8807	3.55
Hardness	ASKER C	JIS K 7312	40
	Shore 00	ASTM D 2240	70
Tensile strength	MPa	JIS K 6251	0.51
Elongation rate	%	JIS K 6251	44
Volume Resistivity	Ω -cm	JIS K 6911 compliant	1.0×10^{12}
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	6.0
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	4.2
Dielectric constant	1MHz	Company standard	12.7
Loss tangent	1MHz	Company standard	0.13
Flammability	—	UL94	V-0 equivalent
Permeability (at 10MHz)	—	—	13
Operating temp	°C	—	-40~110
Available max. dimension.*1	mm	—	210x510

*1) Please contact us for available pcs/sheet.



COOLPROVIDE™/ EMPV5



Thermal conductive sheet available for EMC noise suppression in broad frequency band from 500MHz to 3GHz.

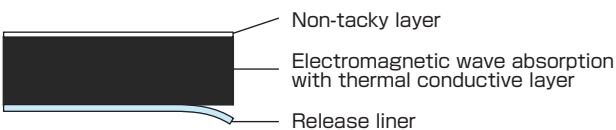
Features

- Original composition is realized EMC noise suppression in broad band from 500MHz to 3GHz.
- Because of a non-silicon material, siloxane is not contained.
- Oil bleed is less, compared with silicone type.

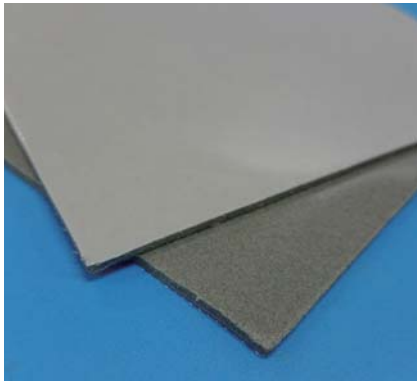
(The values below are not guaranteed.)

Test type	Unit	Standard	EMPV5-F
Thermal Conductivity	W/m·K	ISO22007-2 (Hot Disc method)	0.8
Color	—	—	Black
Thickness	mm	—	1.0/1.5/2.0 2.5/3.0/3.5
Hardness	ASCER C	JIS K 7312	30
	Shore 00	ASTM D 2240	60
Volume Resistivity	Ω -cm	JIS K 6911 compliant	1.0×10^{11}
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	8.8
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	5.0
Flammability	—	UL94	V-0 equivalent
Permeability (at 10MHz)	—	—	7
Operating temp	°C	—	-40~110
Available max. dimension.*1	mm	—	210x510

*1) Please contact us for available pcs/sheet.



COOLPROVIDE™ / CPVP



Ultra soft (ASKER C 0) Thermal Pad

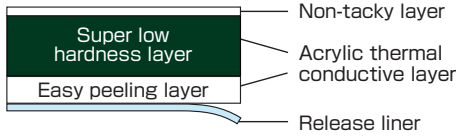
Features

- Super compliant (ASKER C 0) material minimizes thermal resistance.
- Compliant thermal pad with excellent compressive stress relaxation that reduces the load to heat element and PCB.
- Layered design for easy handling.
- Silicone-free, no siloxane outgassing.
- Oil bleeding is reduced compared to silicone-based thermal materials.

(The values below are not guaranteed.)

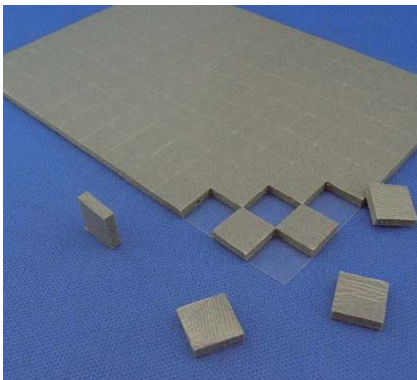
Test type	Unit	Standard	CPVP-F
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	2.0
		ISO22007-2 (Hot Disc method)	1.4
Color	—	—	DarkGreen/White
Thickness	mm	—	1.0/2.0/3.0
			4.0/5.0/6.0
Hardness	ASKER C	JIS K 7312	0 (Super low hardness layer)
Volume Resistivity	Ω·cm	JIS K 6911 compliant	1.0×10 ¹¹
Flammability	—	UL94	V-0
Operating temp	°C	—	-40~125
Available max. dimension.*1	mm	—	210×510

*1) Please contact us for available pcs/sheet.



High Thermal Conductivity Non-silicone

COOLPROVIDE™ / CPSS



Ultra soft (ASKER C 8) Thermal Pad

Features

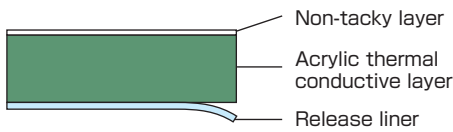
- Super compliant (ASKER C 8) material minimizes thermal resistance
- Compliant thermal pad with excellent compressive stress relaxation. that reduces the load to heat element and PCB.
- Silicone-free, no siloxane outgassing.
- Oil bleeding is reduced compared to silicone-based thermal materials.

(The values below are not guaranteed.)

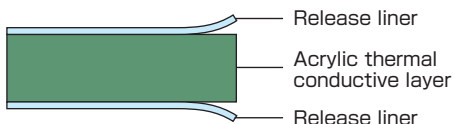
Test type	Unit	Standard	CPSS-F	CPSS
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	2.0	2.0
		ISO22007-2 (Hot Disc method)	1.5	1.5
Color	—	—	DarkGreen	DarkGreen
Thickness	mm	—	1.0/1.5/2.0	4.0
			2.5/3.0/4.0	
Specific Gravity	—	JIS Z 8807	1.92	1.92
Hardness	ASKER C	JIS K 7312	8	8
	Shore OO	ASTM D 2240	33	33
Tensile strength	MPa	JIS K 6251	0.28	—
Elongation rate	%	JIS K 6251	25	—
Volume Resistivity	Ω·cm	JIS K 6911 compliant	1.0×10 ¹²	1.0×10 ¹²
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	3.5	—
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	2.8	—
Dielectric constant	1MHz	Company standard	14.6	—
Loss tangent	1MHz	Company standard	0.09	—
Flammability	—	UL94	V-2(t1.0 - 3.0mm)	—
			V-0(t4.0mm)	
Operating temp	°C	—	-40~100	-40~100
Available max. dimension.*1	mm	—	210×510	210×510

*1) Please contact us for available pcs/sheet.

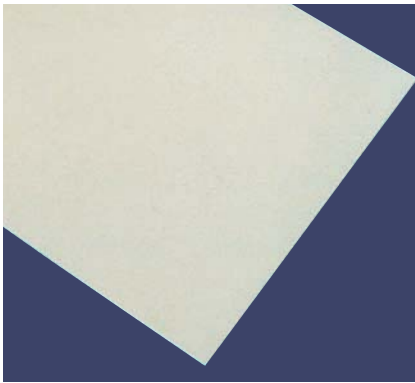
One-side tacky type / CPSS-F



Both-side tacky type / CPSS



COOLPROVIDE™ / SPVS



5W/m·K silicone thermal pad for high operating temperature applications

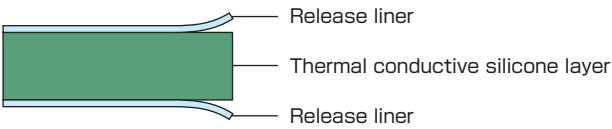
Features

- Volatilization of low-molecular-weight siloxane gas is minimal, which should minimize PCB contact failure in long-term use.

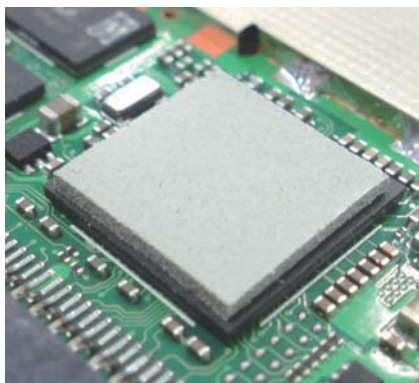
(The values below are not guaranteed.)

Test type	Unit	Standard	SPVS
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	5.0
		ISO22007-2 (Hot Disc method)	3.4
Color	—	—	Green
Thickness	mm	—	0.5/1.0/1.5
Specific Gravity	—	JIS Z 8807	2.75
Hardness	ASCER C	JIS K 7312	70
	Shore 00	ASTM D 2240	86
Tensile strength	MPa	JIS K 6251	0.78
Elongation rate	%	JIS K 6251	46
Volume Resistivity	Ω·cm	JIS K 6911 compliant	3.0×10 ¹¹
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	3.2
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	1.8
Dielectric constant	1 MHz	Company standard	13.7
Loss tangent	1 MHz	Company standard	0.06
Flammability	—	UL94	V-0
Operating temp	°C	—	-20~125
Available max. dimension.*1	mm	—	210×510

*1) Please contact us for available pcs/sheet.



COOLPROVIDE™ / SPV



3W/m·K silicone thermal pad for high operating temperature applications

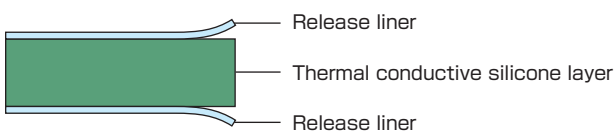
Features

- Soft, high thermal conductive sheet.
- Volatilization of low-molecular-weight siloxane gas is minimal, which should minimize PCB contact failure in long-term use.

(The values below are not guaranteed.)

Test type	Unit	Standard	SPV
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	3.0
		ISO22007-2 (Hot Disc method)	2.3
Color	—	—	Green
Thickness	mm	—	0.5/1.0
Specific Gravity	—	JIS Z 8807	2.2
Hardness	ASCER C	JIS K 7312	40
	Shore 00	ASTM D 2240	69
Tensile strength	MPa	JIS K 6251	0.49
Elongation rate	%	JIS K 6251	160
Volume Resistivity	Ω·cm	JIS K 6911 compliant	2.0×10 ¹¹
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	0.69
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	0.3
Dielectric constant	1 MHz	Company standard	35.1
Loss tangent	1 MHz	Company standard	0.07
Flammability	—	UL94	V-1(t0.5mm)
Operating temp	°C	—	-20~125
Available max. dimension.*1	mm	—	210×510

*1) Please contact us for available pcs/sheet.



THERMAL DAMPER/ CPAG



Thermal conductive and vibration damping material (loss factor of 0.9)

Features

- Dual function thermal conductive and vibration damping.
- Excellent vibration control. (loss factor 0.9)
- Custom profiles can be provided upon request.
- Silicone-free, no siloxane outgassing.

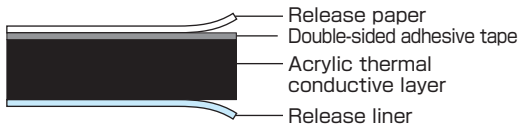
High Thermal Conductivity Non-silicone

(The values below are not guaranteed.)

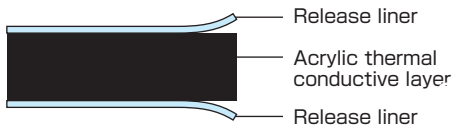
Test type	Unit	Standard	CPAG-T	CPAG
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	0.8	0.8
Color	—	—	Black	Black
Thickness	mm	—	0.5/1.0/2.0 3.0/4.0/5.0	0.5/1.0/2.0 3.0/4.0/5.0
Hardness	ASKER C	JIS K 7312	70	70
	Durometer typeA	JIS K 6253	A 64	A 64
Volume Resistivity	Ω·cm	JIS K 6911 compliant	5.54×10 ¹¹	5.54×10 ¹¹
Flammability	—	UL94	—	V-1 equivalent (2.0mm) V-0 equivalent (3.0 - 5.0mm)
Loss Factor	—	—	0.9	0.9
Operating temp	°C	—	-10~100	-10~100
Available max. dimension.*1	mm	—	340×340	350×350

* 1) Please contact us for available pcs/sheet.

With adhesive tape / CPAG-T



With no adhesive tape / CPAG



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