

Thermal Management Solutions

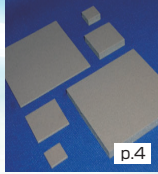
The background features a large, abstract graphic design. It consists of several vertical and diagonal bands of color. A prominent orange band runs vertically down the right side, with a grey band to its left. Below these, the bands expand and curve, creating a sense of depth and movement. The overall aesthetic is clean, modern, and industrial.

Product Lines

Silicone-Free Thermal Interface Materials



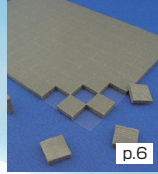
COOLPROVIDE™
/CPVG



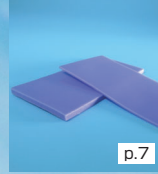
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/CPSH, CPVH



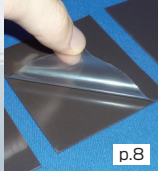
COOLPROVIDE™
/CPVP



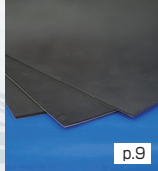
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/CPSS, CPVT



COOLPROVIDE™
/CPLK



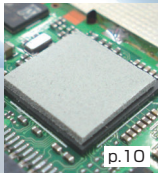
COOLPROVIDE™
/EMPV4, EMPV5



THERMAL DAMPER
/CPAG

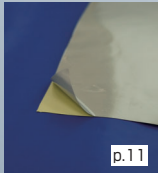
KGS
*First Solution
Proposer*

Silicone-Based Thermal Interface Materials



COOLPROVIDE™
/SPVS, SPV

Special Thermal Interface Materials



HEAT SPREADER
SHEET
/HSD



GERACOLD
/CECD

Icons



Dual Function Thermal and EMC

EMI Suppression and Thermal Pad



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



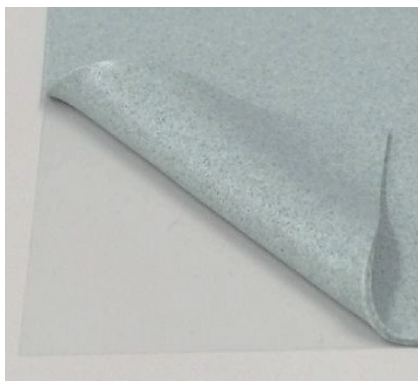
Dual Function Vibration Damper and Thermal

Suppress vibration frequency and transfer heat

COOLPROVIDE™ / CPSH



P.4



5W/m·K Silicone-Free Thermal Pad

Features

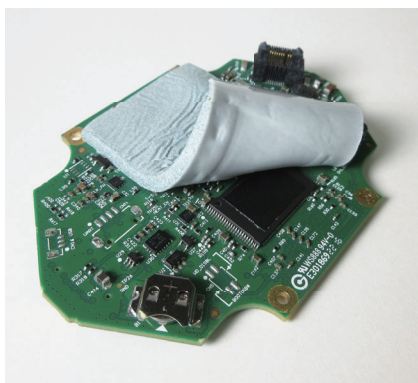
- High performance (5W/m·K) and soft (ASKER C 32) silicone-free thermal pad.
- Crowds out air bubbles to reduce thermal resistance.
- No siloxane outgassing or oil bleed.
- Operating temperature: -40 ~ 125°C
- Custom profile available upon request.

COOLPROVIDE™ / CPVP



P.5

※CPVP: 2.0W/m·K



Silicone-Free Putty-Like Thermal Pad

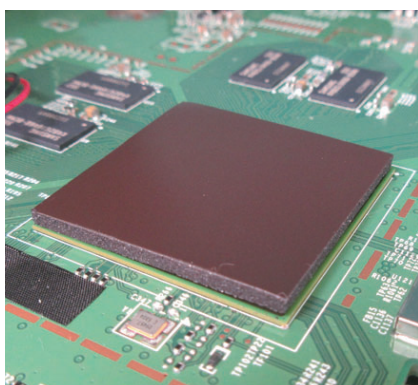
Features

- Low compression force and excellent stress relaxation.
- Super compliant (ASKER C 0) material layered between thin permanent PET film and light tacky layer for easy handling.
- No concerns for siloxane outgassing or oil bleeding.
- Operating temperature: -40 ~ 125°C
- Custom die-cutting available upon request.

COOLPROVIDE™ / EMPV5



P.8



Broadband EMI Absorber and Thermal Pad for Higher Frequencies

Features

- Suppresses noise from 500MHz to 3GHz.
- Silicone-free, no siloxane outgassing.
- Operating temperature: -40 ~ +110°C
- Thermal conductivity: 0.8W/m·K
- Permeability @10MHz: 7

Safety Guidelines

Please review prior to using our products.

1. The contents or products described in this catalog may change without notice due to product improvements and specification updates.
2. All statements, specifications, properties, technical-information, and recommendations herein are based on tests; however, the accuracy and completeness of the values are not guaranteed.
3. Before exporting any product featured in this catalog, ensure compliance with the "Foreign Exchange and Foreign Trade Law." If cargo falls under this regulation, an appropriate export license is necessary. Additionally, be aware that certain countries and regions have restrictions on the sale of these products.
4. KGS assumes no responsibility for any issues related to our intellectual property rights or third-party rights that arise after the use of any product listed in this catalog. Furthermore, KGS does not authorize the licensing of these rights.
5. The content of this catalog applies solely to products purchased directly from us or through authorized agencies. If no information regarding the applicable conditions is provided, or if the products were purchased from a third party, the conditions outlined in the catalog do not apply.
6. Products in this catalog may not be available for sale depending on country or region.
7. Products listed in this catalog are designed and tested for general-purpose applications commonly found in various electronic devices and equipment, such as AV systems, office equipment, computer peripherals, communication devices, home appliances, industrial robots, entertainment systems, personal-use devices, measurement/test units, and similar applications. They are intended for use under normal operating conditions in these general electronic devices and equipment.

This catalog does not guarantee the product's performance or quality, particularly if the product is intended for use in high-safety and high-reliability or other very unique applications, or in situations where device failure, malfunction, or misuse could pose risks or harm to human life and health, cause property damage, or have significant social impact. Please consult us before using our products in these cases, especially if your requirements exceed the product's normal performance range and conditions specified in the catalog, or if you have specific application requirements.

① aerospace equipment, ② transportation equipment (automobiles, trains, ships, and similar vehicles), ③ nuclear power-related equipment, ④ medical equipment, ⑤ military equipment, ⑥ underwater/submarine equipment, ⑦ power generation control equipment, ⑧ 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 unique 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.

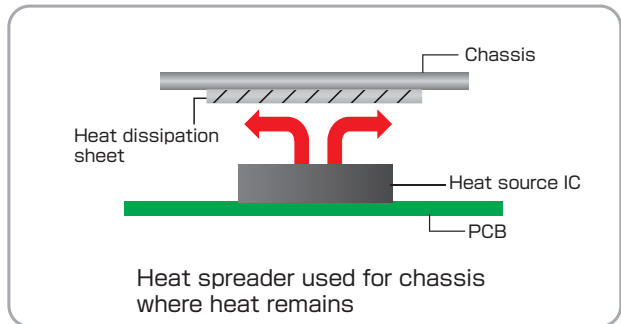
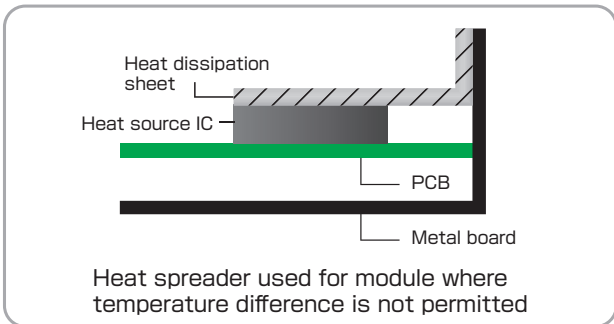
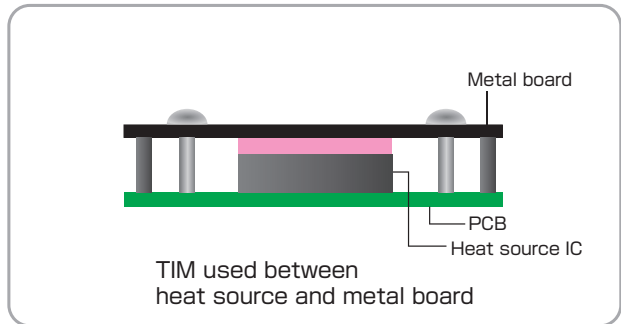
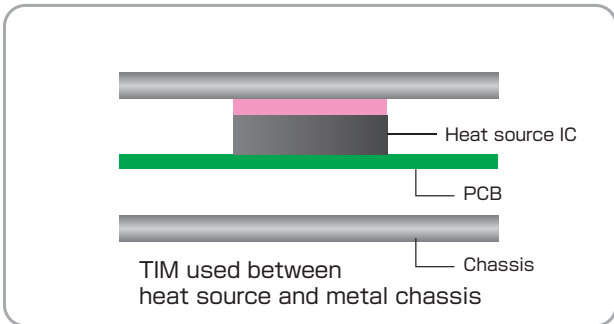
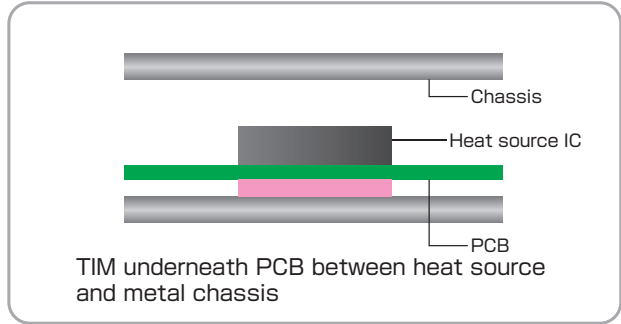
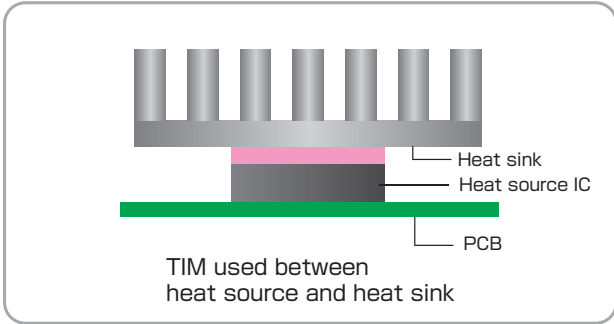
8. While we have implemented comprehensive measures to enhance the safety, quality, and reliability of our product, improper use may potentially result in personal injuries, fire hazards, or societal losses. Contact us for guidance on the correct use of our products.

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[Handling Procedures]

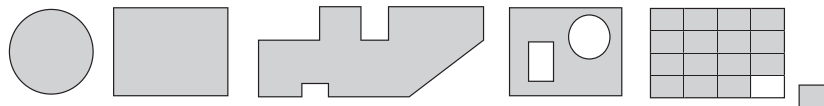
- During installation, avoid contact with the heating element to prevent any burns risks.
- Ensure the surface is free of dirt, dust, oil, or moisture before installing.
- Keep protective release liner in place until use to prevent contamination from debris and dust.
- Product thickness indicated in the catalog does not include the protective release liner.
- Store products at room temperature in a low humidity environment and avoid direct sunlight or UV rays.
- Phase-change gels must be stored below 35°C (Recommended temperature is 25°C).
- Due to the inherent tackiness of our products, removal after heating or compressing may be challenging.

Applications

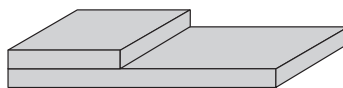


Secondary processing

Cutting (Round, square, special shape, kiss-cutting, etc.)



Customized cutting for multi-layered products



Other processing

(Various other processes are possible. Please feel free to contact our sales.)

Properties of Thermal Conductive Materials (Silicone-Free)

(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)	3.65	3.65	2.1	2.1
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	10	20	4.0	74
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*3	V-0 equivalent	V-0	V-0
Operating temp	°C	—	-40~125	-40~125	-40~125	-40~125
Available max. dimension*1	mm	—	200×500	200×500	200×500	200×500

(The values below are not guaranteed.)

Test type	Unit	Standard	CPVP-F	CPVP-30-F	CPSS-F	CPSS	CPVT-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)	1.4	3.0*4	1.4	1.4	1.4
Color	—	—	Dark green/White	Green/White	Dark green	Dark green	Green
Thickness	mm	—	1.0/1.5/2.0/3.0 4.0/5.0/6.0	3.0/4.0	1.0/1.5/2.0 2.5/3.0/4.0	3.0/4.0	0.10/0.15 0.20/0.25
Specific Gravity	—	JIS Z 8807	—	2.62	1.92	1.92	1.94
Hardness	ASKER C	JIS K 7312	0*4	7*4	8	8	34
	Shore 00	ASTM D 2240	—	18*4	33	33	—
Tensile strength	MPa	JIS K 6251	—	0.38	0.28	—	4.38
Elongation rate	%	JIS K 6251	—	7.9	8.9	—	4.9
Volume Resistivity	Ω·cm	JIS K 6911 compliant	1.0×10 ¹¹	1.0×10 ¹¹	1.0×10 ¹²	1.0×10 ¹²	1.0×10 ¹³
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	—	4.4	3.5	—	11.1
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	—	3.5	2.8	—	5.0
Dielectric constant	1MHz	Company standard	—	11.9	14.6	—	6.69
Loss tangent	1MHz	Company standard	—	0.01	0.09	—	0.08
Flammability	—	UL94	V-0	V-0	V-2(t1.0 - 3.0mm) V-0(t4.0mm)	—	—
Operating temp	°C	—	-40~125	-40~125	-40~100	-40~100	-20~100
Available max. dimension*1	mm	—	200×500	200×500	200×500	200×500	190×490

(The values below are not guaranteed.)

Test type	Unit	Standard	CPLK-F	EMPV4-F	EMPV5-F	CPAG-T	CPAG
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	2.0	1.5	—	0.8	0.8
		ISO22007-2 (Hot Disc method)	1.4	1.3	0.8	—	—
Color	—	—	Purple	Black	Black	Black	Black
Thickness	mm	—	1.0/1.5/2.0	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	2.0	3.55	—	—	—
Hardness	ASKER C	JIS K 7312	30	40	30	70	70
	Shore 00	ASTM D 2240	60	70	60	Durometer typeA 64*5	Durometer typeA 64*5
Tensile strength	MPa	JIS K 6251	0.39	0.51	—	—	—
Elongation rate	%	JIS K 6251	9.1	16	—	—	—
Volume Resistivity	Ω·cm	JIS K 6911 compliant	1.0×10 ¹¹	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	6.6	6.0	8.8	—	—
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	3.0	4.2	5.0	—	—
Dielectric constant	1MHz	Company standard	5.40	12.7	—	—	—
Loss tangent	1MHz	Company standard	0.003	0.13	—	—	—
Flammability	—	UL94	V-0 equivalent	V-0 equivalent	V-0 equivalent	—	V-1 equivalent(t2.0mm) V-0 equivalent(t3.0 - 5.0mm)
Operating temp	°C	—	-40~125	-40~110	-40~110	-10~100	-10~100
Available max. dimension*1	mm	—	200×500	200×500	200×500	345×345	345×345*6

*1) For usable dimensions, custom cuts, and material yield, contact your local sales department. *2) 0.5F : ASKER C 55

*3) Flammability V-0 is not applied to 0.5F. *4) Super low hardness layer. *5) JIS K 6253 compliant *6) t=0.5 : 200×200

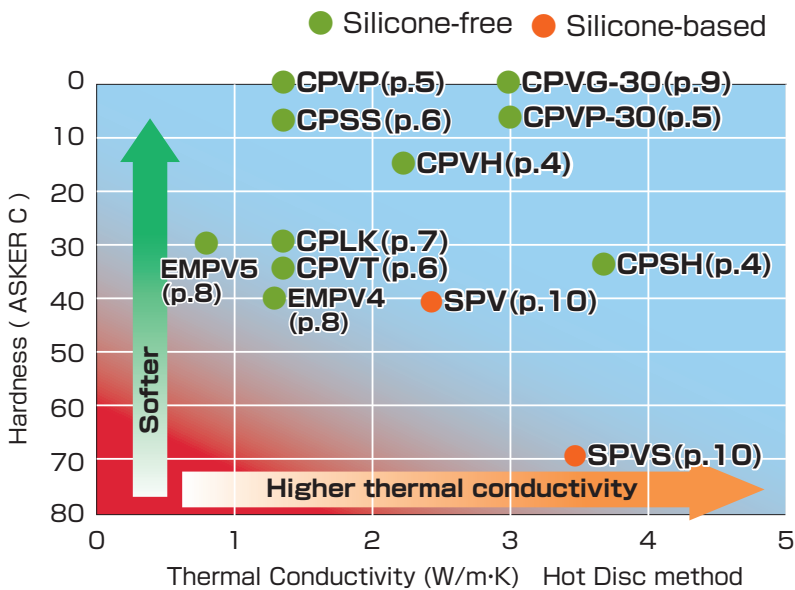
(The values below are not guaranteed.)

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	16	59
Volume Resistivity	$\Omega\cdot\text{cm}$	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	1 MHz	Company standard	13.7	35.1
Loss tangent	1 MHz	Company standard	0.06	0.07
Flammability	—	UL94	V-0*2	V-1 (t0.5mm)
Operating temp	°C	—	-20~125	-20~125
Available max. dimension*1	mm	—	200x500	200x500

※ 1) For usable dimensions, custom cuts, and material yield, contact your local sales department.

※ 2) Flammability V-0 is not applied to t=1.5.

Comparison of Product Series



※ CPVP is shown for super low hardness layer only

COOLPROVIDE™ / CPVG





Single-liquid thermal putty designed for dispensing

Features

- Single liquid putty does not drip even when thickly coated.
- Useful to fill gaps between heat spreaders and ICs of various heights. CPVG-30: GAP 1mm or less
- Putty TIM applies very low force after compression. (10% or less as compared to thermal pads)
- Silicone-free TIM generates no siloxane gas and has low oil bleeding.

Results of drip test

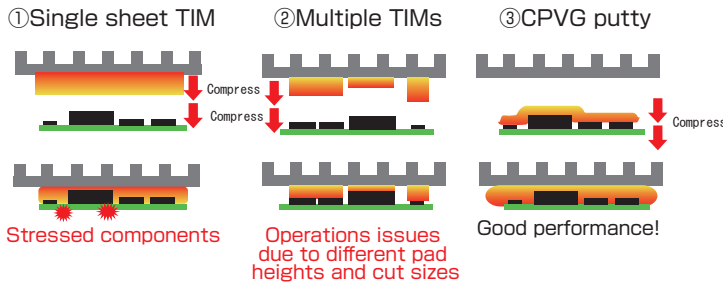
Other company's grease	CPVG-30
	
dripping observed	no drip

[Test conditions]
 Temperature: 125°C
 Time: 1000h
 Coating thickness: t=1mm
 Materials: Glass + Aluminum plate

(The values below are not guaranteed.)

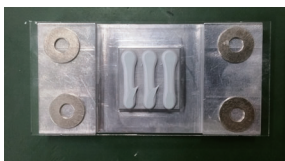
Test type	Unit	Standard	CPVG-30
Thermal Conductivity	W/m · K	ISO22007-2 (Hot Disc method)	3.0
Thermal resistance	t1.0mm	ASTM D5470	0.33
	t0.3mm		0.08
	t0.1mm		0.01
Color	—	—	Gray
Specific Gravity	—	JIS Z 8807	2.9
Viscosity	0.5[1/s]	ASTM D1824 compliant	3,300
	1.0[1/s]		2,500
Volume Resistivity	Ω · cm	JIS K 6911 compliant	1.0 × 10 ⁹
Breakdown voltage	kV/mm	JIS K 6911 compliant	8
Relative permittivity	500MHz	Company standard	8.98
	1GHz	Company standard	8.88
Flammability	—	UL94	V-0 equivalent
Operating temp	°C	—	-40 ~ 125
Product form when supplied	—	—	Cartridge: 330ml

Benefits of CPVG (Putty TIM) and the load on ICs



	①	②	③
Workability	○	×	○ → CPVG putty easily applied at specific locations
Load on IC	×	△	○ → Low load on ICs, since the putty spreads into gaps when compressed

③ CPVG putty as applied

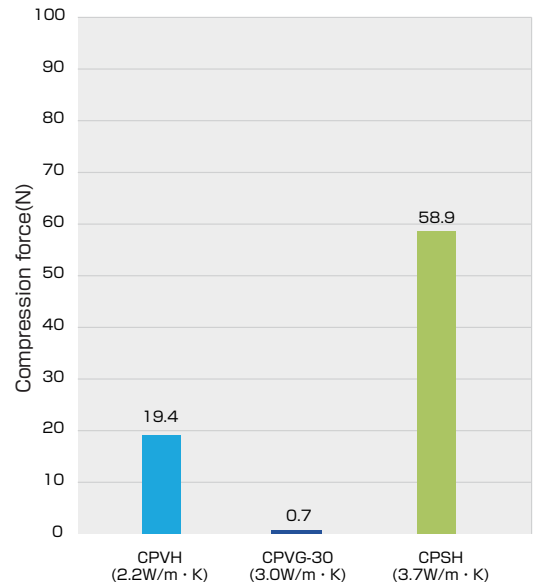


③ CPVG putty as assembled



KGS will provide support to evaluate and verify the best dispensing method for your specific application.

Compression Force Comparison between CPVG Putty and Thermal Pads



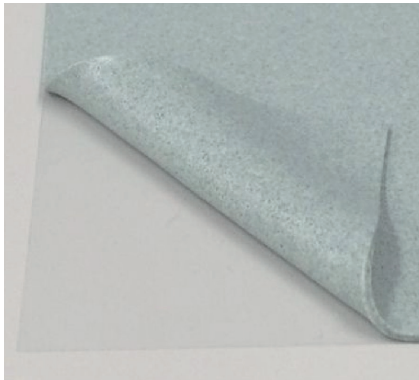
※ 1) The thermal conductivity of each product is measured by the hot disk method.

※ 2) Compression property test

< Test conditions >

- Sample dimensions : □10mm × 10mm (t2mm)
- Compression rate : 20% compressed

COOLPROVIDE™ / CPSH



5W/m·K Silicone-Free Thermal Pad

Features

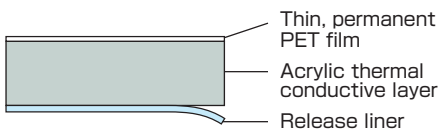
- High performance (5W/m·K) and soft (ASKER C 32) silicone-free thermal pad.
- Crowds out air bubbles to reduce thermal resistance.
- No siloxane outgassing or oil bleed.
- Operating temperature: -40 ~ 125°C
- Custom profile available upon request.

(The values below are not guaranteed.)

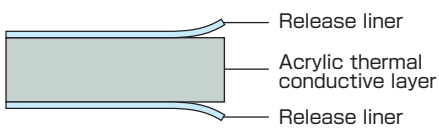
Test type	Unit	Standard	CPSH-F	CPSH
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	5.0	5.0
		ISO22007-2 (Hot Disc method)	3.65	3.65
Color	—	—	Light green	Light green
Thickness	mm	—	0.5/1.0/1.5/2.0	1.0/1.5/2.0
			2.5/3.0/3.5/4.0	2.5/3.0/3.5/4.0
Specific Gravity	—	JIS Z 8807	2.89	2.89
Hardness	ASKER C	JIS K 7312	32*1	32
	Shore 00	ASTM D 2240	64	64
Tensile strength	MPa	JIS K 6251	0.37	0.21
Elongation rate	%	JIS K 6251	10	20
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
Tracking resistance	—	JIS C 2134	600≤CTI (t=4.0mm)	600≤CTI (t=4.0mm)
Dielectric constant	1MHz	Company standard	18.2	18.8
Loss tangent	1MHz	Company standard	0.01	0.01
Flammability	—	UL94	V-0*2	V-0 equivalent
Operating temp	°C	—	-40~125	-40~125
Available max. dimension.*1	mm	—	200×500	200×500

*1) 0.5F:ASKER C 55 *2) Flammability V-0 is not applied to 0.5F.
*3) For usable dimensions, custom cuts, and material yield, contact your local sales department.

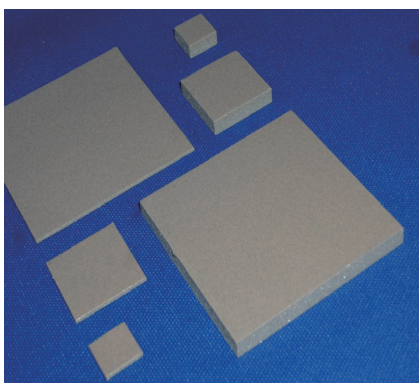
One-side tacky type / CPSH-F



Both-side tacky type / CPSH



COOLPROVIDE™ / CPVH



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

Features

- Soft and compilable (ASKER C 15) silicone free thermal pad helps to crowd out air bubbles and reduce thermal resistance.
- No siloxane outgassing or oil bleed.
- Operating temperature: -40 ~ 125°C
- Custom profile available upon request.

(The values below are not guaranteed.)

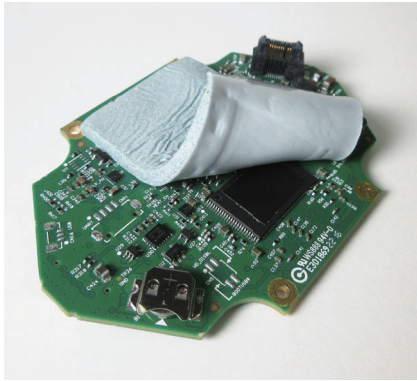
Test type	Unit	Standard	CPVH-F	CPVH
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	3.0	3.0
		ISO22007-2 (Hot Disc method)	2.1	2.1
Color	—	—	Brown	Brown
Thickness	mm	—	0.5/1.0/1.5/2.0	2.0/3.0/4.0
			2.5/3.0/3.5/4.0	
Specific Gravity	—	JIS Z 8807	2.33	2.33
Hardness	ASKER C	JIS K 7312	15	15
	Shore 00	ASTM D 2240	47	47
Tensile strength	MPa	JIS K 6251	0.25	0.15
Elongation rate	%	JIS K 6251	4.0	7.4
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
Tracking resistance	—	JIS C 2134	600≤CTI (t=4.0mm)	600≤CTI (t=4.0mm)
Dielectric constant	1MHz	Company standard	18.2	19.6
Loss tangent	1MHz	Company standard	0.08	0.08
Flammability	—	UL94	V-0	V-0
Operating temp	°C	—	-40~125	-40~125
Available max. dimension.*1	mm	—	200×500	200×500

*1) For usable dimensions, custom cuts, and material yield, contact your local sales department.

COOLPROVIDE™ / CPVP



※CPVP : 2.0W/m-K



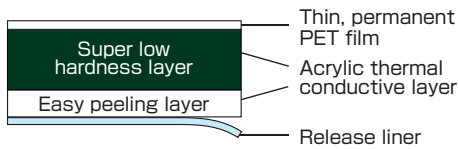
2-layer putty-like thermal pad with excellent stress relief

Features

- Low compression force and excellent stress relaxation.
- Super compliant (ASKER C 0) material layered between thin permanent PET film and light tacky layer for easy handling.
- No concerns for siloxane outgassing or oil bleeding.
- Operating temperature: -40 ~ 125°C
- Custom die-cutting available upon request.

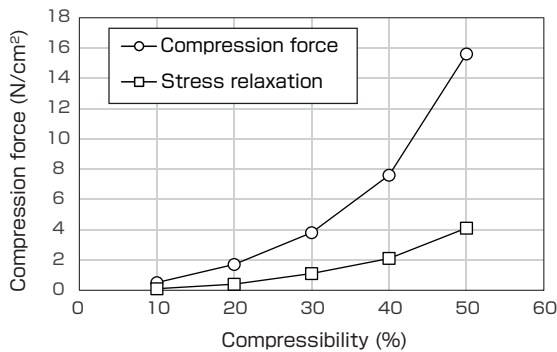
(The values below are not guaranteed.)

Test type	Unit	Standard	CPVP-F	CPVP-30-F
Thermal Conductivity	W/m-K	JIS R 2616 (Hot-wire method) ISO22007-2 (Hot Disc method)	2.0 1.4	— 3.0*2
Color	—	—	Darkgreen/White	Green/White
Thickness	mm	—	1.0/1.5/2.0/3.0 4.0/5.0/6.0	3.0/4.0
Specific Gravity	—	JIS K 7312	—	2.62
Hardness	ASKER C	ASTM D 2240	0*2	7*2
	Shore 00	JIS K 6251	—	18*2
Tensile strength	MPa	JIS K 6251	—	0.38
Elongation rate	%	JIS C 2134	—	7.9
Volume Resistivity	Ω-cm	JIS K 6911 compliant	1.0×10 ¹¹	1.0×10 ¹¹
Tracking resistance	—	JIS C 2134	600≤CTI (t=6.0mm)	—
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	—	4.4
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	—	3.5
Dielectric constant	1MHz	Company standard	—	11.9
Loss tangent	1MHz	Company standard	—	0.01
Flammability	—	UL94	V-0	V-0
Operating temp	°C	—	-40~125	-40~125
Available max. dimension*1	mm	—	200×500	200×500

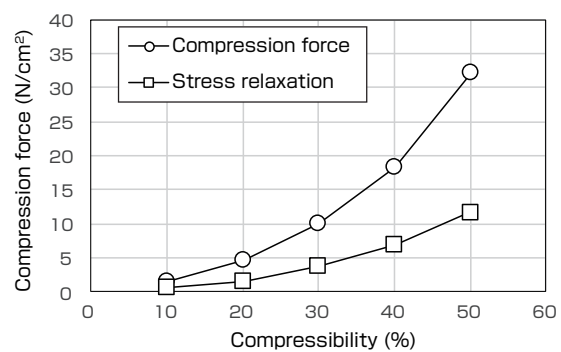


Compressive stress relaxation properties

● CPVP-F



● CPVP-30-F



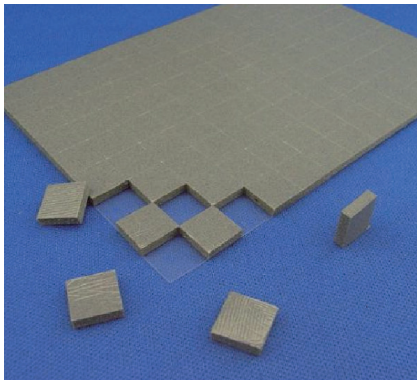
〈Test conditions〉

Sample dimensions : □10mm(t=4.0mm)
Cross-head speed : 1mm/min

Compression plate materials
Upper : Stainless steel Φ28mm
Lower : Gold plated copper Φ106mm

※ Compression force values are the largest load immediately after compression.
※ Stress relaxation values are load after 3 minutes of compression.

COOLPROVIDE™ / CPSS



Super low hardness (ASKER C 8) Thermal Pad

Features

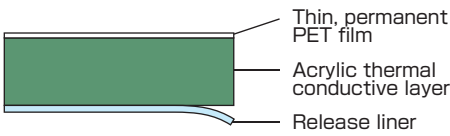
- 2W/m·K and compliable (ASKER C 8) allows for less pressure on the heat source, such as the IC or PCB.
- Allows for lower thermal resistance on an uneven surfaces.
- Silicone-free material - no siloxane outgassing.

(The values below are not guaranteed.)

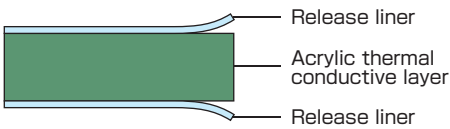
Test type	Unit	Standard	CPSS-F	CPSS
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	2.0	2.0
		ISO22007-2 (Hot Disc method)	1.4	1.4
Color	—	—	Darkgreen	Darkgreen
Thickness	mm	—	1.0/1.5/2.0	3.0/4.0
			2.5/3.0/4.0	
Specific Gravity	—	JIS Z 8807	1.92	1.92
Hardness	ASKER C	JIS K 7312	8	8
	Shore OO	ASTM D 2240	33	33
Tensile strength	MPa	JIS K 6251	0.28	—
Elongation rate	%	JIS K 6251	8.9	—
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	—
Tracking resistance	—	JIS C 2134	600≤CTI (t=4.0mm)	600≤CTI (t=4.0mm)
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	—	200×500	200×500

※ 1) For usable dimensions, custom cuts, and material yield, contact your local sales department.

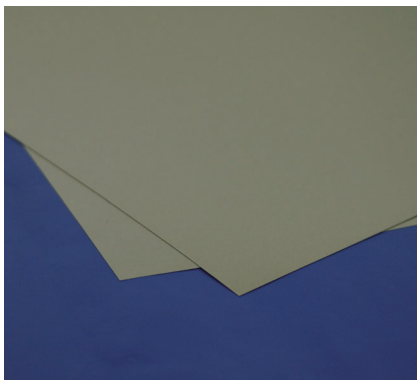
One-side tacky type / CPSS-F



Both-side tacky type / CPSS



COOLPROVIDE™ / CPVT



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

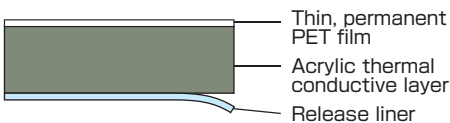
Features

- 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 compliable (ASKER C 28) material minimizes thermal resistance.
- Silicone-free, no siloxane outgassing.
- Suitable for thin designs of peripheral devices such as smartphones, tablets, etc.

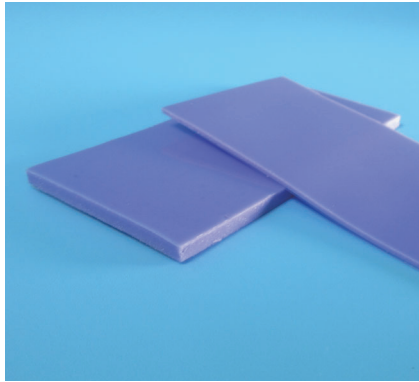
(The values below are not guaranteed.)

Test type	Unit	Standard	CPVT-F
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	2.0
		ISO22007-2 (Hot Disc method)	1.4
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	34
	Shore OO	ASTM D 2240	—
Tensile strength	MPa	JIS K 6251	4.38
Elongation rate	%	JIS K 6251	4.9
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	—	190×490

※ 1) For usable dimensions, custom cuts, and material yield, contact your local sales department.



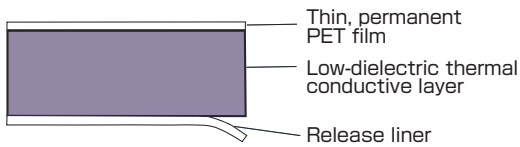
COOLPROVIDE™ / CPLK



Dual Function Noise Suppression Thermal Pad

Features

- CPLK's low permittivity 14.6/1MHz has a significant effect on noise reduction.
- Low-dielectric thermally conductive sheet helps to reduce noise in GHz bands, which occurs by heat sink's resonance phenomena.
- Silicone-free generates no siloxane gas and oil bleeding.

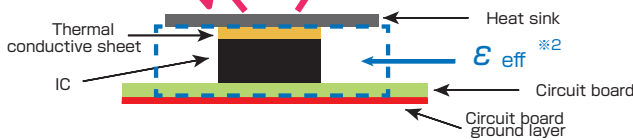


(The values below are not guaranteed.)

Test type	Unit	Standard	CPLK-F
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	2.0
		ISO22007-2 (Hot Disc method)	1.4
Color	—	—	Purple
Thickness	mm	—	1.0/1.5/2.0
Specific Gravity	—	JIS Z 8807	2.0
Hardness	ASKER C	JIS K 7312	30
	Shore OO	ASTM D 2240	60
Tensile strength	MPa	JIS K 6251	0.39
Elongation rate	%	JIS K 6251	9.1
Volume Resistivity	Ω·cm	JIS K 6911 compliant	1.0×10 ¹¹
Breakdown voltage	kV/mm	JIS C 2110-1 compliant	6.6
Withstanding voltage	kV/mm	JIS C 2110-1 compliant	3.0
Dielectric constant	1MHz	Company standard	5.40
Loss tangent	1MHz	Company standard	0.003
Flammability	—	UL94	V-0 equivalent
Operating temp	°C	—	-40~125
Available max. dimension ^{※1}	mm	—	200×500

Resonance Phenomena

Resonance frequency is influenced by the dimensions of the heat sink, as well as the permittivity within the resonator.

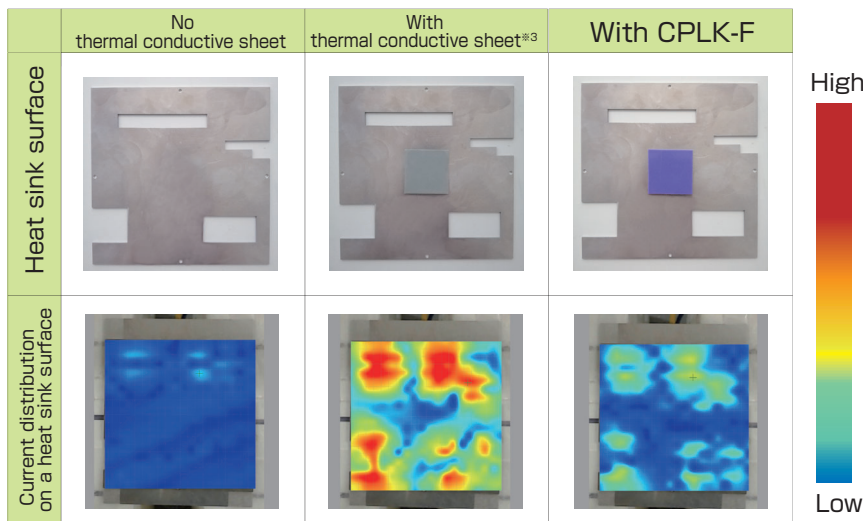


The dielectric constant of the TIM has a significant effect on noise radiation.

※1) For usable dimensions, custom cuts, and material yield, contact your local sales department.

Effects of Dielectric (measured)

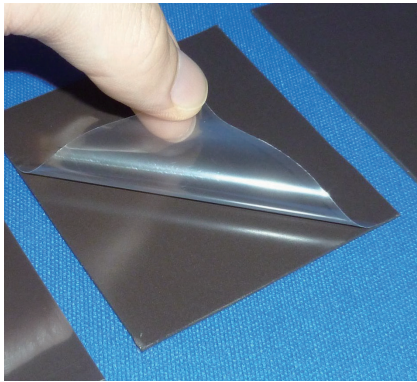
1.0 GHz~1.2 GHz Magnetic field intensity in vicinity of heat sink



※2 ϵ_{eff} =Equivalent relative permittivity between a heat sink and a ground layer of a circuit board

※3 Relative permittivity : $\epsilon' = 35$

COOLPROVIDE™/ EMPV4



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

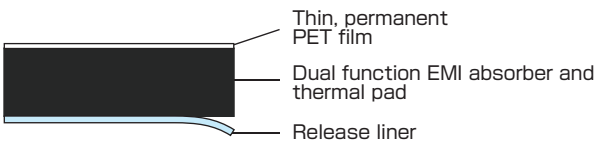
Features

- Excellent EMI absorber performance ($\mu' = 13$ @10MHz) 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.

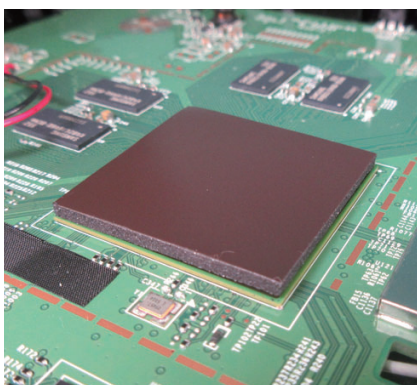
(The values below are not guaranteed.)

Test type	Unit	Standard	EMPV4-F
Thermal Conductivity	W/m-K	JIS R 2616 (Hot-wire method)	1.5
		ISO22007-2 (Hot Disc method)	1.3
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	%	JIS K 6251	16
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	—	200x500

※ 1) For usable dimensions, custom cuts, and material yield, contact your local sales department.



COOLPROVIDE™/ EMPV5



Broadband EMI Absorber and Thermal Pad for Higher Frequencies

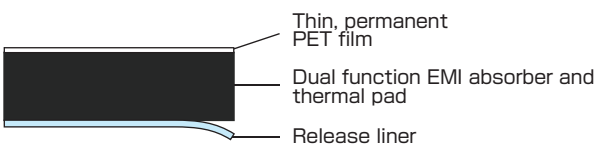
Features

- Suppresses noise from 500MHz to 3GHz.
- Silicone-free, no siloxane outgassing.
- Operating temperature: -40 ~ +110C
- Thermal conductivity: 0.8W/m-K
- Permeability @10MHz: 7

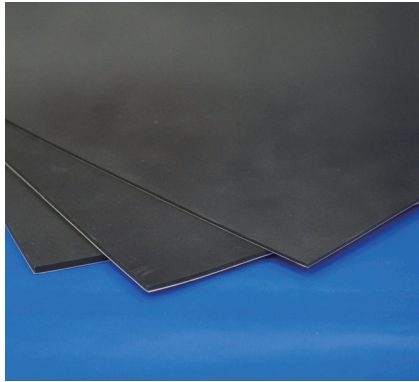
(The values below are not guaranteed.)

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	—	200x500

※ 1) For usable dimensions, custom cuts, and material yield, contact your local sales department.



THERMAL DAMPER/ CPAG



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

Features

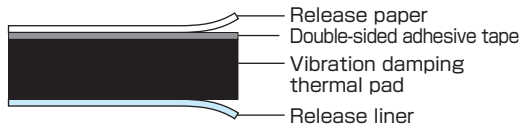
- Dual function thermal conductive and vibration damping sheet.
- Excellent vibration control. (loss factor 0.9)
- Custom profiles can be provided upon request.
- Silicone-free, no siloxane outgassing.

(The values below are not guaranteed.)

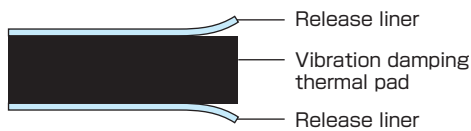
Test type	Unit	Standard	CPAG-T	CPAG
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	0.8	0.8
Color	—	—	Black	Black
Thickness	mm	—	0.5/1.0/2.0 3.0/4.0/5.0	0.5/1.0/2.0 3.0/4.0/5.0
Hardness	ASKER C	JIS K 7312	70	70
	Durometer typeA	JIS K 6253	A 64	A 64
Volume Resistivity	Ω·cm	JIS K 6911 compliant	5.54×10 ¹¹	5.54×10 ¹¹
Flammability	—	UL94	—	V-1 equivalent (t2.0mm) V-0 equivalent (t3.0 - 5.0mm)
Loss Factor	—	—	0.9	0.9
Operating temp	°C	—	-10~100	-10~100
Available max. dimension ^{*1}	mm	—	340×340	350×350 ^{*2}

*1) For usable dimensions, custom cuts, and material yield, contact your local sales department.
*2) t=0.5 : 200×200

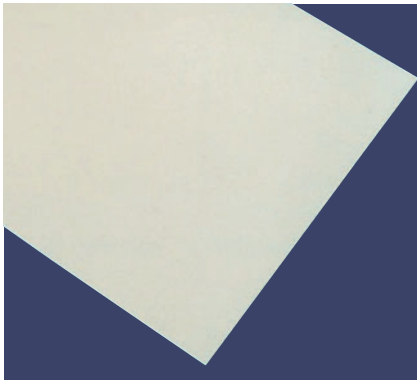
With adhesive tape / CPAG-T



With no adhesive tape / CPAG



COOLPROVIDE™ / SPVS



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

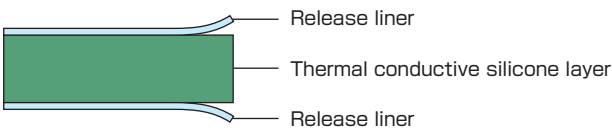
Features

- Minimal volatile, low-molecular weight siloxane gas for reduced PCB contact failure.
- High performance, high thermal conductivity.
- Operating temperature range -20~125°C

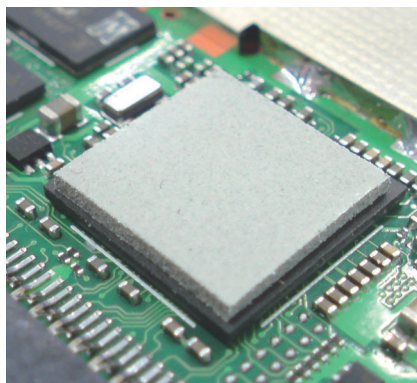
(The values below are not guaranteed.)

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	Shore OO	ASCER C	70
		ASTM D 2240	86
Tensile strength	MPa	JIS K 6251	0.78
Elongation rate	%	JIS K 6251	16
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	1MHz	Company standard	13.7
Loss tangent	1MHz	Company standard	0.06
Flammability	—	UL94	V-0*2
Operating temp	°C	—	-20~125
Available max. dimension,*1	mm	—	210×510

*1) For usable dimensions, custom cuts, and material yield, contact your local sales department.
*2) Flammability V-0 is not applied to t=1.5.



COOLPROVIDE™ / SPV



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

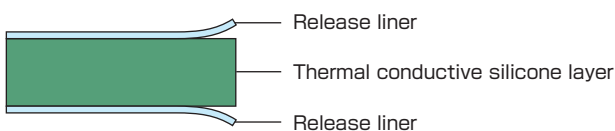
Features

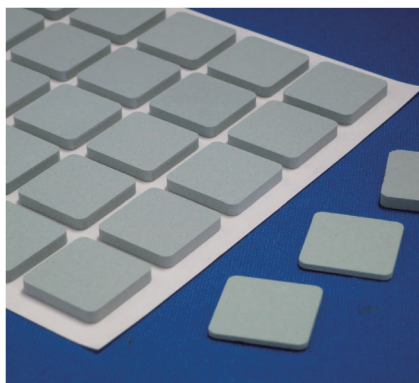
- Soft, high thermal conductive sheet.
- Minimal volatile, low-molecular weight siloxane gas for reduced PCB contact failure.

(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	Shore OO	ASCER C	40
		ASTM D 2240	69
Tensile strength	MPa	JIS K 6251	0.49
Elongation rate	%	JIS K 6251	59
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	1MHz	Company standard	35.1
Loss tangent	1MHz	Company standard	0.07
Flammability	—	UL94	V-1(t0.5mm)
Operating temp	°C	—	-20~125
Available max. dimension,*1	mm	—	210×510

*1) For usable dimensions, custom cuts, and material yield, contact your local sales department.

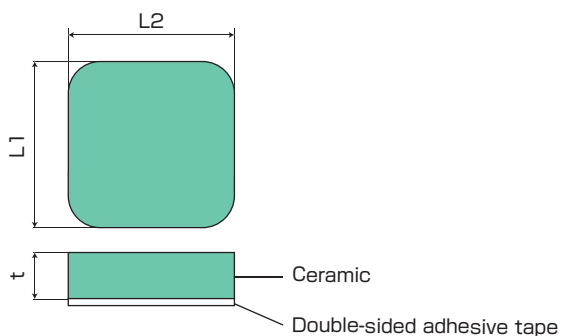




Porous ceramic-based heat sink for excellent heat dissipation

Features

- Larger surface area of porous ceramic heat sink improves thermal emissivity and heat dissipation compared to standard aluminum heat sinks.
- Ceramic heat sinks are approximately 30% lighter than aluminum heat sinks.
- Unlike metal heat sinks, ceramic heat sinks do not emit electromagnetic radiation.



(Unit:mm)

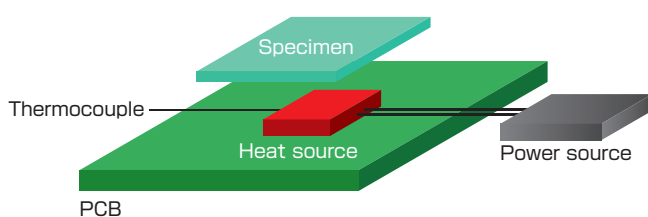
Part Number	Thickness:t	L1	L2
CECD-1.5-020020T	1.5	20	20
CECD-3.0-020020T	3.0	20	20
CECD-3.0-040040T	3.0	40	40

(The values below are not guaranteed.)

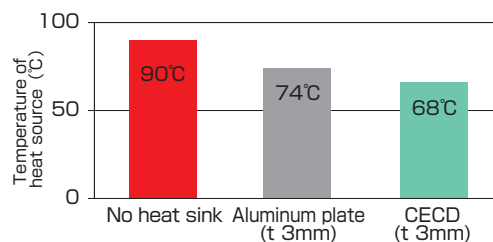
Test type	Unit	Standard	CECD
Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	11.5
Color	—	—	Green
Specific Gravity	—	JIS Z 8807	1.95
Volume Resistivity	$\Omega \cdot \text{cm}$	JIS K 6911 compliant	$\geq 10^8$
Operating temp	$^{\circ}\text{C}$	—	-40~125

Heat dissipation efficiency

Heat conductive characteristics



Comparison of Heat Sink Efficiency



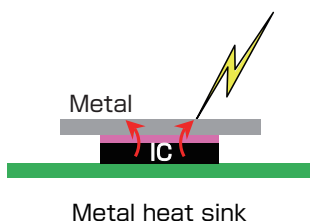
<Test conditions>

Heat source : □10mm(1.6W)

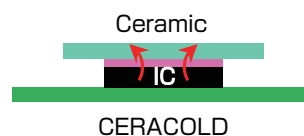
Specimen dimensions: □20mm(t3mm)

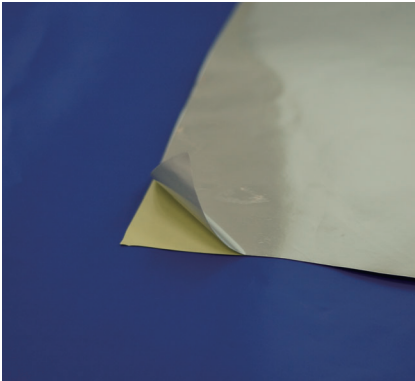
EMI noise issues with metal heat sink

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



CECD ceramic heat sink is electrically insulating. CECD is not affected by electrostatic coupling and does not function as an antenna to radiate noise.



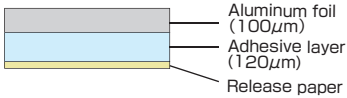


Thin and flexible heat spreading sheet for superior thermal management

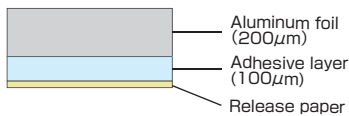
Features

- Aluminum heat spreader material with excellent thermal conductivity. (221 W/m·K)
- Spreads heat away from hot spots to cooler areas to prevent components from overheating.
- Optional electrically insulating mylar (PET) layer can be applied upon request.
- Ideal thermal solution for hot spots on space conscious applications such as mobile devices, tablets, routers, video streaming devices, etc.

HSD-0.22



HSD-0.30

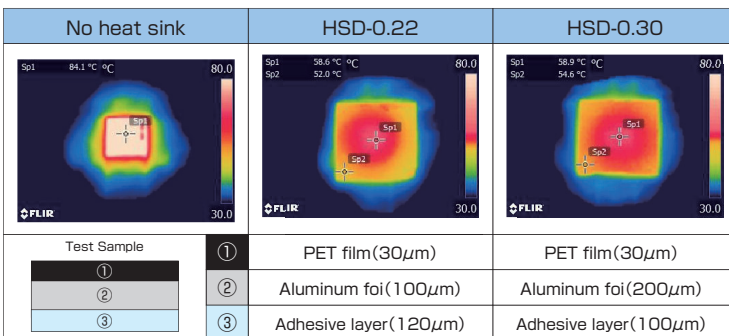


(The values below are not guaranteed.)

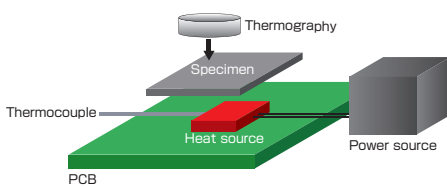
Test type	Unit	Standard	HSD-0.22	HSD-0.30
Surface Thermal Conductivity	W/m·K	JIS R 2616 (Hot-wire method)	221 (aluminum)	
Thickness	mm	—	0.22	0.30
Adhesion	N/25mm	JIS Z 0237:2009	>16	>11
Flammability	—	UL	—	—
Operating temp	°C	—	-20~100	

Heat Dissipation Effect

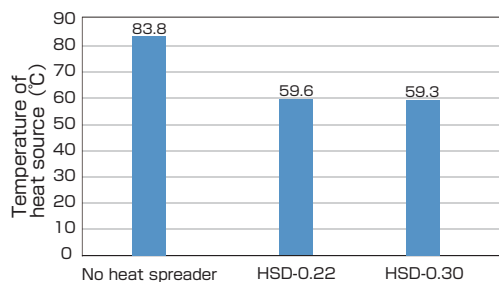
heat distribution



Testing method



HSD Series Heat Dissipation Effect



<Test conditions>

Heat source : □25mm(1.5W)

Specimen dimensions : □50mm

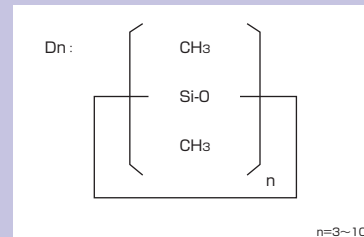
Low-molecular-weight siloxane

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.

$$\lambda \text{ (thermal conductivity)} = (Q \cdot d) / (\Delta T \cdot S)$$

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.

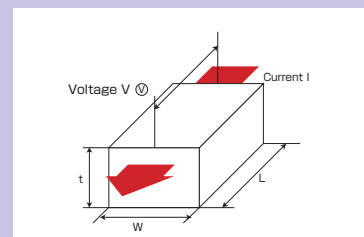
$$R1 \text{ (thermal resistance): } ^\circ\text{C} / \text{W} = d / (\lambda \cdot S)$$

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 (1cm^3) is referred as volume resistivity, which is a material property and is measured in $[\Omega \cdot \text{cm}]$.

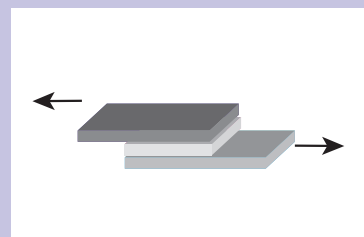
As shown in right diagram, the volume resistivity is calculated by measuring a voltage difference $V(V)$ between two contacts across the cross section ($t \cdot W$) generated by a constant current I (A) flow.



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.



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