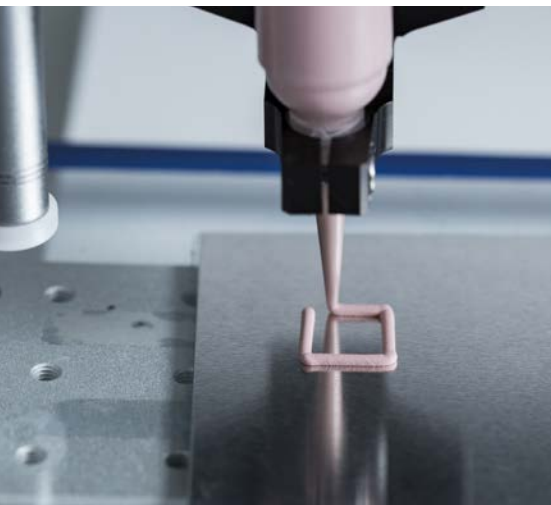
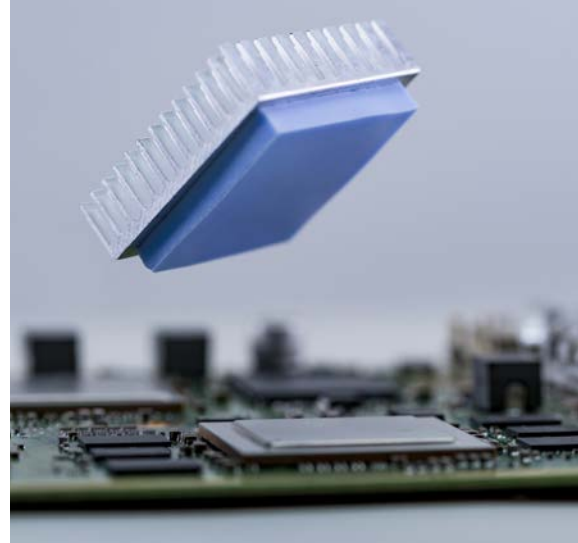




KEEP COOL PERFORM BETTER

Thermal Interface Materials for Today's Electronics

Portfolio of Products

Honeywell

HONEYWELL

THERMAL INTERFACE

SOLUTIONS

As an advanced materials supplier, Honeywell has been meeting the application needs of electronic device manufacturers for more than 50 years, and we continue to provide vital materials for thermal management solutions across multiple industries.

THERMAL INTERFACE MATERIALS FOR TODAY’S ELECTRONICS

CONTENTS	
Product Selection Guide	3
Honeywell Strength & Advantages	4
Targeted Materials	5
Phase Change Materials	6
Thermal Gap Filler Pads	8
Thermal Putty Pads	10
Thermal Insulators	11
Thermal Grease	12
One-Part Hybrid	14
Two-Part Hybrid	16

OVERVIEW SELECTION GUIDE

HONEYWELL THERMAL INTERFACE MATERIALS				
APPLICATION	SOLUTION FAMILIES	PRODUCTS	KEY FEATURES	THERMAL CONDUCTIVITY (W/m·K)
High Reliability Thin Bondline	Phase Change Materials	LTM Series	Paste Only	1.8-2.4
		PCM45F Series	High Reliability	2.0-2.5
		PTM5000 Series	High Reliability	3.5-4.5
		PTM6000 Series	High Reliability	3.5-4.5
		PTM7000 Series	Low TI, High Reliability	6.0-8.5
High Compressibility Gap Filler	Thermal Gap Filler Pads	TGP1200	Cost Effectiveness	1.2
		TGP1500	Cost Effectiveness	1.5
		TGP3000	Low Hardness	3.0
		TGP5000	Low Hardness	5.0
		TGP6000	Low Oil Bleeding	6.0
		TGP8000	Low Oil Bleeding, Low Outgassing, Low Hardness	8.0
		TGP8000HV	High Breakdown Voltage	8.0
		TGP8000LV	Low Volatile	8.0
		HGP10000	High Thermal	10.0
		HGP12	High TC	12.0
	Thermal Putty Pads	TGP2000PT	Extra Soft, Cost Effectiveness	2.5
		TGP3510PT	Extra Soft	3.5
		TGP6000PT	Extra Soft	6.0
		TGP8000PT	Extra Soft	8.0
	Silicone Free Pads	TGP3000SF	Non-silicone	3.0
		TGP8000SF	Non-silicone	8.0
Thermal Conductivity Electrical Isolation	Thermal Insulators	TIP1500	High Breakdown Voltage	1.5
		TIP3500	High Breakdown Voltage	3.5
		TIP5000	High Breakdown Voltage	5.0
Ease of Application Thin Bondline	Thermal Grease	TG2000I	Cost Effectiveness, Electrical Isolation	2.0
		TG2800I	Cost Effectiveness, Electrical Isolation	2.8
		TG3000I	Cost Effectiveness, Electrical Isolation	3.0
		TG3000	Cost Effectiveness	3.0
		TG4000	High TC, Low TI	4.0
		TG5500	High TC, Low TI	5.0
Automation Gap Filler	One-Part Hybrid	HT3000	Thermosetting, reworkable	3.5
		HT3500	Cost Effectiveness	3.5
		HT4500	Printable	4.5
		HT5010	Pre-cure, Low Oil Bleeding	5.0
		HT7000	Pre-cure, Low Oil Bleeding	7.0
		HT9000C	Thermosetting, Reworkable, High TC	9.0
		HT10000	Pre-cure, Low Oil Bleeding	10.0
	Two-Part Hybrid	HLT1800	Low density, Cost Effectiveness	1.8
		HLT2000	Cost Effectiveness	2.0
		HLT3000	Easy to Dispense Printable	3.0
		HLT3500	Cost Effectiveness	3.5
		HLT3500LV	Low Volatile	3.5
		HLT7000	High Reliability, Easy to Dispense	7.0
		HLT10000	High Reliability, Easy to Dispense	10.0

HONEYWELL STRENGTH

For over half a century, Honeywell has been a key supplier to the worldwide electronics industry, providing critical materials to enhance the performance and reliability of our customers' products. No matter what the strength, resource or the best application, Honeywell ranks among the global leaders.

SOLVING INCREASING THERMAL CHALLENGES FOR TODAY AND TOMORROW

Our ongoing investment in research for more advanced materials has resulted in breakthroughs for key applications of thermal interface materials (TIMs) such as phase change materials, and Hybrid, Thermal Gap Filler Pads.

The modern electronics industry is constantly advancing toward higher power consumption, more integrated functions and miniaturization, resulting in a sharp

increase in the power density of modern electronic devices.

Therefore, efficient heat dissipation has become an even more critical requirement for the design of modern electronic packages. Thermal interface materials (TIMs) are widely employed to manufacture the most critical parts in the heat dissipation system, to cool and protect integrated circuit (IC) chips.

Honeywell TIMs are based on proprietary technologies of polymer matrices and

thermally conductive fillers, enabling them to handle challenging heat dissipation issues with long-term reliability and low cost of ownership



Honeywell's research and development center in Shanghai, China.

A FOUNDATION OF EXPERTISE

Honeywell's commitment to advanced materials research is evidenced by its three global centers for excellence in the US and China.

Whether adapted from our extensive portfolio of proven materials, or created for a specific customer, all Honeywell products undergo rigorous research, testing and quality control protocols.

COUNT ON HONEYWELL

- 50+ years providing materials for electronic products.
- More than 1,000 employees across the United States, Europe and Asia.
- 3 major R&D centers located in California, Washington and China.
- Continuous investment in research and development.
- Worldwide strategic collaborations.
- Approximately 400 granted and pending patents

TARGETED MATERIALS

Smartphones and tablets experience sudden temperature spikes, requiring very high heat dissipation, while power electronics in automobiles need extreme thermal stability to meet warranties that stretch over long lifetimes. Our TIMs portfolio is designed to meet these varying needs and more.

OUR APPROACH

We have designed our products to optimize thermal impedance. This means that we look at the entire thermal path, not just the TIM itself. This includes the material interfaces, the thermal expansion of the joining interfaces, contact resistance and bond line thicknesses.

Our portfolio of materials dissipate heat away from the IC, in an appropriate way for the device structure, packaging design and application. The design of Honeywell's phase change materials (PCMs) is driven

by an innovative polymer technology and advanced filler systems, which can be customized to fit diverse product applications and end uses.



In addition to our phase change materials, we offer a variety of products with high thermal conductivity and high compressibility, including thermal gap filler pads, thermal Hybrid, thermal grease, thermal insulators, and more.

Honeywell's application support experts can help you choose the correct thermal interface solutions for your product — taking into account its design, usage and life cycle.

DETERMINING YOUR TIM REQUIREMENTS

The role of Thermal Interface Materials is to dissipate heat as quickly and effectively as possible from the device, but not all devices are the same. Requirements are driven by product use, product life cycle, packaging design, and operating conditions.

Thermal Performance

Increasing power densities are raising device temperatures — requiring more effective TIM solutions that must deliver low thermal impedance and high bulk conductivity. Reducing operating temperature can reduce device throttling, while increasing efficiency and design flexibility.

Product Life Cycle & Reliability

Mobile products such as smartphones and tablets have a relatively short product life, but still require thermal management to protect from extreme and sudden bursts of energy and temperature spikes.

Conversely, automotive, power and server products must remain robust for significantly longer product life cycles. These applications involve harsh operating conditions such as extreme heat and humidity, which must be taken into account in choosing the best TIM material. The key requirement in these applications is not just real-time performance but also sustained, long-term thermal stability.

Gaps & Bondline Thickness

IC designers are continually looking for ways to achieve more processing power in less space. Additionally, high power devices with dedicated heat sinks aim to achieve an extremely thin TIM bond line with low thermal impedance and a reduced thermal path. chip-scale packages assembled on a PCB will share the same heat spreader but will have different heights with varying gaps, requiring a TIM that delivers both thermal and compressible properties.

Taking all this into consideration, it is important for today's TIMs to provide effective thermal management in increasingly constrained environments and different assembly designs.

THERMAL PHASE CHANGE MATERIALS

Honeywell Phase change materials (PCM) are often used as matrix materials for thermal interface applications, because they are solid at room temperature, and soften when heated. They can fully fill the gaps of contact surfaces, therefore providing a thin bondline and high reliability without pump-out issues.

Models: LTM6300, PCM45F, PTM5000, PTM6000, PTM6000HV, PTM7000, PTM7900, PTM7950

TYPICAL APPLICATIONS

- Power control unit, inverter, onboard electronics
- IGBT
- Servers, supercomputing, video graphic array (VGA) cards, AI, GPU/CPU/Desktop, solid state drives (SSD)
- Switches, routers, base stations
- Tablets, gaming, notebooks, smartphones, action cameras
- Lighting

THERMALLY CONDUCTIVE PHASE CHANGE MATERIAL

For many applications, the Honeywell solution. TC filler to the PCM matrix, forms a phase change composite with high heat transfer performance that solves all types of pump-out issues.

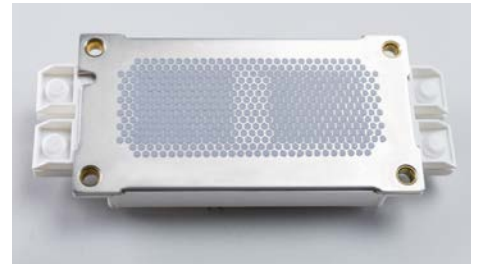
Honeywell offers both pad and paste formats for its thermally conductive PCM. These products were designed to minimize thermal resistance at interfaces and maintain stable performance through the rigorous reliability testing required for long product life applications.

Based on a robust polymer structure, this material exhibits effective wetting properties during typical operating temperature ranges, resulting in very low surface contact resistance. The proprietary material provides superior reliability and maintains low thermal impedance, making PCM desirable for high-performance integrated circuit devices.

Honeywell offers PCM in both pad and paste formats.



For almost 20 years, PCM products have been a Honeywell mainstay for thermal solutions in a wide variety of applications.



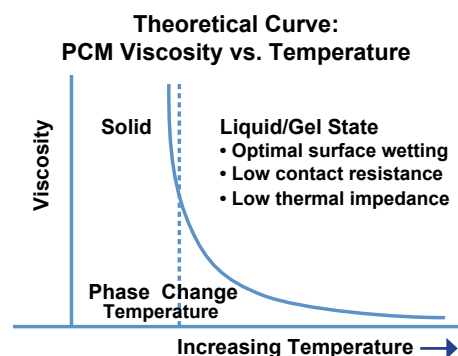
PCM paste is well-suited for the stencil printing application process.



FEATURES

- High performance filler and polymer technology
- Phase change at 45°C
- Highly conductive filler loading to optimize performance
- Superior handling and reworkability
- Superior reliable thermal performance
- Range of thermal properties to fit different needs

PCM PERFORMANCE



Recommended Application

Clamping pressure and temperature are suggested to achieve a minimum bond line thickness, typically less than 1.5 mil (0.038mm) for best thermal performance.

Storage & Use

Shelf Life: 12 months (Storage condition on the package for directions)

Availability

PCM pad is available in both sheet and roll formats. Thickness Range: 0.2mm-1.0mm
Stencil printable (SP) material is available in 300cc syringes or 1kg jars.

TYPICAL PROPERTIES

PROPERTY DESCRIPTION	LTM SERIES	PCM45F SERIES	PTM5000 SERIES	PTM6000 SERIES*	PTM7000 SERIES	TEST METHOD
Physical Properties						
Specific Gravity	1.8	2.2	2.3	2.3	2.7	ASTM D374
Thickness Range (mm)	NA	0.20-1.00	0.20-1.00	0.20-1.00	0.20-1.00	NA
Thermal Properties						
Thermal Conductivity (W/m·K)	1.8-2.4	2.0-2.5	3.5-4.5	3.5-4.5	6.0-8.5	ASTM D5470
Thermal Impedance @ no shim (°C·cm²/W)	0.12-0.14	0.09-0.12	0.06-0.08	0.06-0.08	0.04-0.06	ASTM D5470 Modified
Electrical Properties						
Volume Resistivity (ohm·cm)	3.0×10 ¹⁵	8.2×10 ¹⁴	2.1×10 ¹⁴	2.1×10 ¹⁴	2.1×10 ¹⁴	ASTM D257

*PTM6000 has higher reliability than PTM5000 Series

THERMAL GAP FILLER PADS

Honeywell Thermal Gap Filler Pads (TGPs) provide a variety of products for many applications. Ultra-high compressibility enables low stress and excellent conformity to mating surfaces. Honeywell TGP models are naturally tacky, and require no additional adhesive which could inhibit thermal performance.

Models: TGP1200, TGP1500, TGP3000, TGP5000, TGP6000, TGP8000, HGP10000, HG12

TYPICAL APPLICATIONS

- Consumer electronics
- Telecommunications & network servers
- Automotive electronics
- Power devices & modules
- Semiconductor logic & memory



Honeywell TGP model gap filler pads are available in standard sheets and also custom die-cut parts, and in a range of thicknesses.

THERMALLY CONDUCTIVE, HIGH COMPRESSIBILITY GAP FILLER PAD

Honeywell TGP models provide thermal performance with ease of use across a multitude of applications. They have been designed to minimize thermal resistance at interfaces, and maintain effective performance through reliability testing. TGP models are silicone based, therefore they offer a certain anti-shock effect, with electrical isolation and non-flammability.

Honeywell TGP models are naturally tacky, and require no additional adhesive which could inhibit thermal performance. A range of thicknesses from 0.5mm to 5.0mm are available. Honeywell TGP models come with two surface liners, which enables users to remove the liner after installation (before operation), with no contaminant risk and easier handling.



The low oil-bleeding property protects components from contamination.



Low hardness provides excellent surface wetting and high compressibility.

FEATURES

- High thermal performance
- Ultra-high compressibility for low stress applications
- Excellent surface wetting for low contact resistance
- High reliability
- Electrically insulating
- Ultra-low volatile versions are available for optical communication and optical module industry.

Storage & Use

Shelf Life: 12 months (Storage condition on the package for directions)

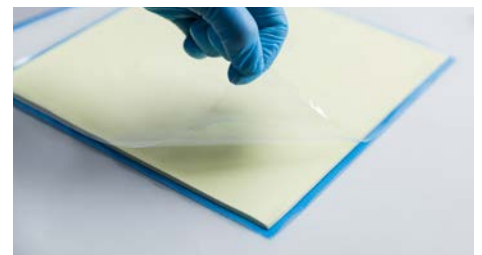
Thickness Range:

0.5-5.0mm with 0.25mm incremental

Thickness Tolerance:

- >1mm, $\pm 10\%$
- 0.5-1mm, $\pm 0.1\text{mm}$
- <0.5mm, $\pm 0.05\text{mm}$

Please check thickness availability before ordering.



Two surface liners enable easier handling with less contamination risk.

TGP1200 – HGP12 TYPICAL PROPERTIES

PROPERTY	TGP 1200	TGP 1500	TGP 3000	TGP 5000	TGP 6000	TGP 8000	HGP 10000	HGP 12	TEST METHOD
Physical Properties									
Color	Blue	Grey	Yellow	Blue	Grey	Grey	Grey	Pink	Visual
Thickness (mm)	0.5-5	0.5-5	0.5-5	0.5-5	0.5-5	0.5-5	1-5	1-5	ASTM D374
Hardness (Shore00)	40	40	40	45	40	30	40	30	ASTM D2240
Specific Gravity	1.7	1.8	3.1	3.3	3.3	3.4	3.2	3.3	ASTM D792
Thermal Properties									
Thermal Conductivity (W/m·K)	1.2	1.5	3.0	5.0	6.0	8.0	10	12	ASTM D5470
Thermal Impedance (°C·in ² /W) (1mm@10psi) ¹	1.19	0.85	0.51	0.3	0.25	0.2	0.16	0.13	ASTM D5470
Electrical Properties									
Dielectric Constant @1MHz	4.5	5.5	6.8	5.0	8.5	8.3	5.5	5.5	ASTM D150
Volume Resistivity (ohm·cm)	4.0 x 10 ¹²	2.0 x 10 ¹³	5 x 10 ¹³	9 x 10 ¹³	4 x 10 ¹⁵	7 x 10 ¹⁵	2x10 ¹³	1.4x10 ¹⁴	ASTM D257
Flammability Properties									
Flammability Rating	V-0	V-0	V-0	V-0	V-0	V-0	-	-	UL94

¹Typical Value

Contact Honeywell for more information

TGP8000HV, TGP8000LV, TGP8000SF

THERMALLY CONDUCTIVE, HIGH BREAKDOWN VOLTAGE GAP FILLER PAD

TGP8000HV is a Thermal Gap Filler Pad which offers a strong combination of low thermal impedance, high breakdown voltage and ease of use across a wide variety of applications. The naturally tacky property means there is no need for an additional adhesive, which could inhibit thermal performance. Available formats for TGP8000HV include standard sheets and custom die-cut parts in a range of thicknesses.

Applications & Features

In addition to the features of the TGP1200-HGP10000 line, TGP8000HV is effective for applications that require high breakdown voltage. In 8W series, Honeywell provides other solutions as well. TGP8000LV shows excellent performance on low volatile while TGP8000SF is designed for applications which are sensitive to silicone oil.

TGP8000HV TGP8000LV TGP8000SF TYPICAL PROPERTIES

PROPERTY	TGP 8000HV	TGP 8000LV	TGP 8000SF	TEST METHOD
Physical Properties				
Color	Grey	Light grey	Light grey	Visual
Thickness (mm) ²	0.5-5.0	0.5-5.0	0.5-5.0	ASTM D374
Hardness (Shore00)	60	40	60	ASTM D2240
Specific Gravity	3.5	3.5	3.4	ASTM D792
Thermal Properties				
Thermal Conductivity (W/m·K)	8.0	8.0	8.0	ASTM D5470
Thermal Impedance (°C·in ² /W) (1mm@10psi) (Typical Value)	0.20	0.19	0.19	ASTM D5470
Electrical Properties				
Dielectric Strength (V/mm)	8000	8000	8000	ASTM D149
Dielectric Constant @1MHz	8.3	8.3	8.3	ASTM D150
Volume Resistivity (ohm·cm)	6.47 x 10 ¹⁵	1.1 x 10 ¹⁴	3 x 10 ¹⁵	ASTM D257
Flammability Properties				
Flammability Rating	V-0	V-0	V-0	UL94

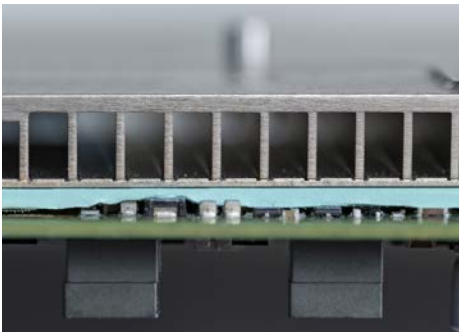
² Thickness range: 0.5-5.0mm with 0.25mm incremental
Thickness Tolerance: >=1mm, ±10%, 0.5-1mm, ±0.1mm

THERMAL PUTTY PADS

Honeywell Thermally Conductive Putty Pads provide high thermal performance and solid thermal reliability. The material's putty-like consistency enables excellent gap-filling capability for applications with large dimensional variances.

TYPICAL APPLICATIONS

- EV battery & charging station
- Automotive electronics
- Power devices & modules
- Telecommunications & network servers



TGP putty pad materials are ideal for applications with large dimensional variations between surfaces.



Models: TGP2000PT, TGP3500PT, TGP6000PT, TGP8000PT

HIGH THERMAL CONDUCTIVITY, HIGH COMPRESSIBILITY, THERMAL PUTTY PAD

Special surface reinforcement enables easier handling for operators, with no pull-out during high-volume assembly. The product is naturally tacky and requires no additional adhesive to mate to the heat source and heat sink. Thermal putty pads are available in thicknesses ranging from 0.5mm to 5.0mm. Single and double glass fiber structures are available.

Storage & Use

Shelf Life: 12 months (Storage condition on the package for directions)

FEATURES

- High thermal performance
- Ultra-soft
- High compressibility
- Excellent gap-filling capability
- Naturally tacky

TYPICAL PROPERTIES

PROPERTY	TGP 2000PT	TGP 3500PT	TGP 6000PT	TGP 8000PT	TEST METHOD
Physical Properties					
Color	Pink	White	Grey	Grey	Visual
Thickness (mm) ¹	0.5-5	0.5-5	0.5-5	0.5-5	ASTM D374
Hardness (Shore00)	5.0	5.0	5.0	5.0	ASTM D2240
Specific Gravity	2.9	3.2	3.4	3.5	ASTM D792
Thermal Properties					
Thermal Conductivity (W/m·K)	2.5	3.5	6.0	8.0	ASTM D5470
Thermal Impedance (°C·in ² /W) (1mm@10psi) (Typical Value)	0.65	0.45	0.27	0.19	ASTM D5470
Electrical Properties					
Dielectric Constant @1MHz	6.0	6.4	6.5	8.5	ASTM D150
Volume Resistivity (ohm·cm)	4.0 x 10 ¹³	4.0 x 10 ¹³	4.0 x 10 ¹⁵	4.0 x 10 ¹⁵	ASTM D257
Flammability Properties					
Flammability Rating	V-0	V-0	V-0	V-0	UL94

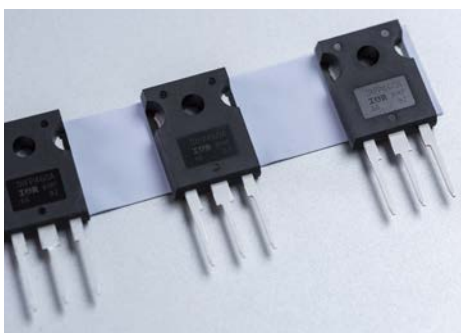
¹ Thickness range: 0.5-5.0mm with 0.25mm incremental
Thickness Tolerance: ≥1mm, ±10%, 0.5-1mm, ±0.1mm

THERMAL INSULATORS

Honeywell thermal insulation (TIP) are produced from silicone resin as the matrix and glass fiber as the filler. It has excellent thermal insulation performance, tear resistance and puncture resistance, providing a better choice for high-power and high-voltage applications. The Thermal Insulators series is Honeywell's latest high-performance thermal conductivity and insulation material. It is made with silicon resin as the matrix, reinforced with glass fiber as the substrate.

TYPICAL APPLICATIONS

- Automotive electronics
- Power conversion equipment
- Power supply equipment
- Motor controllers
- Speaker amplifier
- Power switch



The TIP series provides low thermal impedance and high insulation for high power and high voltage applications.



Storage & Use

Shelf Life: 12 months (Storage condition on the package for directions)

Configurations Available

Sheet form and die-cut parts

Models: TIP1500, TIP3500 TIP5000

HIGH THERMAL CONDUCTIVITY, ELECTRICAL INSULATION

TIP1500 combines 1.5 W/m-K, TIP5000 combines 5W/m-K, TIP3500 combines 3.5 W/m-K thermal conductivity, with superior insulation. TIP1500, TIP3500, TIP5000 are designed to be soft and conformal, which provides excellent mating surfaces for low-pressure mounting. TIP1500 is offered in 0.19 and 0.23mm thickness. TIP3500 and TIP5000 available thicknesses range from 0.25mm to 0.50mm.

FEATURES

- High thermal performance
- High breakdown voltage
- Good resistance to tears, cut-throughs and punctures
- Single side PSA available for easy assembly

TYPICAL PROPERTIES

PROPERTY	TIP1500	TIP3500	TIP5000	TEST METHOD
Physical Properties				
Color	Pink	Blue	White	Visual
Thickness (mm) ²	0.19, 0.23	0.25-0.50	0.25-0.50	ASTM D374
Hardness (Shore A)	90	80	90	ASTM D2240
Specific Gravity	2.21	2.47	2.5	ASTM D792
Thermal Properties				
Thermal Conductivity (W/m-K)	1.5	3.5	5.0	ASTM D5470
Thermal Impedance °C-in ² /W @10psi (typical value)	0.91@0.19mm 0.93@0.23mm	0.23	0.18@0.25mm	ASTM D5470
Thermal Impedance °C-in ² /W @50psi (typical value)	0.54@0.19mm 0.61@0.23mm	0.18	0.15@0.25mm	ASTM D5470
Electrical Properties				
Dielectric Breakdown Voltage (V)	>6000	>6000	>4500	ASTM D149
Dielectric Constant @1MHz	5.50	3.30	3.50	ASTM D150
Volume Resistivity (ohm-cm)	1 x 10 ¹³	5 x 10 ¹³	5 x 10 ¹³	ASTM D257
Flammability Properties				
Flammability Rating	V-0	V-0	V-0	UL94

² Thickness tolerance: TIP1500: ±0.01mm, (±0.02mm for single side PSA product), TIP3500: ±10% TIP5000: ±10%

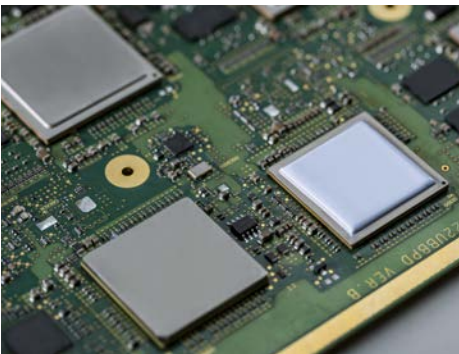
THERMAL GREASE

Honeywell Thermal grease products provide superior thermal performance with ease of use across a multitude of applications. The low viscosity and inherent thixotropy make the technology a good fit for large-scale production with dispensing, screen printing and stencil printing.

Models: TG2000I, TG2800I, TG3000, TG3000I, TG4000, TG5500

TYPICAL APPLICATIONS

- CPU, GPU and chipsets
- LED assemblies
- Automotive electronics
- IGBT & power units
- Flipchip BGAs



Low viscosity and excellent thixotropy make thermal grease appropriate for large-scale production.



Packaging availability:
0.5kg can, 1kg can, 5 gallon pail

HIGH THERMAL CONDUCTIVITY THERMAL GREASE

Thermal Grease is a common silicone thermal interface material, usually used to increase thermal contact conductance across jointed solid surfaces.

Silicone thermal grease is a composite containing silicone and inorganic or metal nanomaterials with high thermal conductivity. Compared with thermal pads or liquid gap fillers, grease has the lower viscosity, and it can be used by dispense or screenprint, forming a thinner thermal conductivity layer with high thermal conductivity performance.

Honeywell thermal greases are designed to minimize thermal resistance at interfaces, and maintain excellent performance through reliability testing. Thermal Grease products series are offered with varying thermal impedance and thermal conductivity properties to complement different power densities in real applications. Products are also available in a range of bondline thicknesses (BLT) to meet variations in interface flatness.

FEATURES

- Low viscosity and excellent thixotropy for dispensing or screen/stencil printing
- Range of BLT thicknesses
- Thermal resistance and thermal conductivity options for different power densities
- High stability and reliability
- Stable and homogeneous at room temperature storage

Storage & Use

Shelf Life: 12 months (Storage condition on the package for directions)



Honeywell thermal grease remains stable under room temperature storage.

TYPICAL PROPERTIES							
PROPERTY	TG2000I	TG2800I	TG3000	TG3000I	TG4000	TG5500	TEST METHOD
Physical Properties							
Color	Blue	Yellow	Grey	White	Grey	Grey	-
Viscosity (cps@25 ° C)	90,000	100,000	150,000	200,000	200,000	300,000	Brookfield Viscometer
Specific Gravity	3.0	4.2	2.7	3.4	2.7	2.5	ASTM D792
BLT (μm) (35psi, 50 ° C)	30	25	25	10	23	23	HON Internal
Thermal Properties							
Thermal Conductivity (W/m·K)	2.0	2.8	3.0	3.0	4.0	5.5	Hot Disk
Thermal Impedance (° C·in ² /W) (35psi, 50 ° C)	0.020	0.014	0.014	0.005	0.011	0.010	ASTM D5470
Electrical Properties							
Dielectric Constant @1MHz	>6	>9	>10	>5	>10	>10	ASTM D150
Volume Resistivity (ohm·cm)	1.0 x 10 ¹³	1.3 x 10 ¹³	1.0 x 10 ¹²	2.0 x 10 ¹²	1.0 x 10 ¹²	1.0 x 10 ¹²	ASTM D257
Flammability Properties							
Flammability Rating	V-0	V-0	V-0	V-0	V-0	V-0	UL94
Working Temperature (° C)	-40~150	-40~150	-40~150	-40~150	-40~150	-40~150	-

THERMAL ONE-PART HYBRID

Thermal conductivity liquid gap fillers not only have the benefits of superior shape recovery, strong material cohesion, and good long-term thermal stability – they also offer very low thermal resistance comparable to thermal grease, and can fill gaps at interfaces.

Models: HT3000, HT3500, HT4500, HT5010, HT7000, HT9000C, HT10000

TYPICAL APPLICATIONS

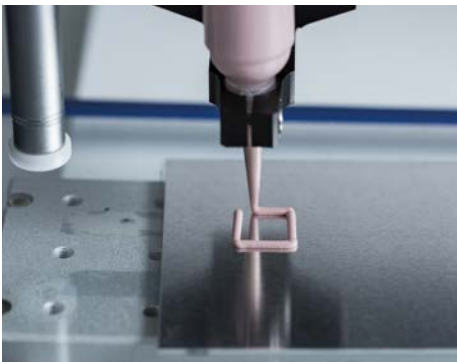
- Consumer electronics
- Telecommunications equipment
- Automotive electronics
- Power supplies
- Memory & power modules
- Power electronics

ONE-PART, DISPENSABLE, VERY LOW COMPRESSION FORCE, THERMAL HYBRID

Hybrid is a substance between liquid and solid, combining the advantages of thermal grease and thermal gap filler pad, without the potential problems of either. Thermal Hybrid is prepared as a silicone polymer, with low molecular siloxane, and mixed with high thermal conductivity particles (such as alumina, aluminum nitride powder, etc.).

FEATURES

- High thermal performance and low contact resistance
- Easily dispensable and reworkable
- High compressibility for low stress applications
- Long-term reliability
- No pump-out or cracking risk
- Reduced oil separation



One-part thermal Hybrid offer good dispensing and thixotropy properties for automated assembly processes.

Compared with thermal grease, the main difference is that thermal Hybrid does not present oil separation issues while in storage, and the Hybrid can be torn off and reused. Thermal Hybrid only needs a relatively low working pressure when connected with heat sink and chip, and has a wide working temperature range.

The HT series, our one-part Gap Filler, provides effective thermal properties and high conformability along with its high compressibility. It is formulated to deliver high dispense rates for improved productivity, long-term reliability

performance and easy re-workability. It is designed to minimize thermal resistance at interfaces, maintain its performance through reliability testing, and provide scalable application at a competitive cost. All HT series products are available in 280cc aluminum cartridge, and 1 and 5-gallon pail.

Storage & Use

Shelf Life 6 months (Storage condition on the package for directions)

Availability

Syringes 280cc

Jar 1gal, 5gal



Honeywell's thermal Hybrid materials provide good surface wetting without slump after dispensing.



A large selection of packaging options is available for our one-part and two-part thermal Hybrid products.

TYPICAL PROPERTIES								
PROPERTY	HT3000	HT3500	HT4500	HT5010	HT7000	HT9000C*	HT10000*	TEST METHOD
Feature	Post-cured	Pre-cured	Pre-cured	Pre-cured	Pre-cured	Post-cured	Pre-cured	-
Color	Yellow	Dark Red	Green	Grey	Pink	*	*	Visual
Specific Gravity	3.1	3.2	3.3	3.4	3.45	*	*	ASTM D792
Thermal Conductivity (W/m·K)	3.5	3.5	4.5	5.0	7.0	9.0	10.0	ASTM D5470
Thermal Impedance (°C·cm ² /W)		0.5		0.28	0.21		*	ASTM D5470 at BLT
Minimum BLT (mm)	0.15	0.10	0.06	0.14	*	*	*	Honeywell Internal
Dispense Rate (g/min)	60	>10	>40	>14	>14	*	*	90psi, 30cc EFD syringe
Storage Condition	-10-5°C	RT	RT	RT	RT	<5°C	*	-
Shelf Life (months)	6	12	12	12	12	6	*	-

THERMAL TWO-PART HYBRID

Honeywell Two-Part Hybrid series products are two-component, dispensable thermally conductive gels, which offer long-term reliability and superior softness. The enhanced bonding force between the polymer matrix and the filler minimizes oil separation issues in storage.

Models: HLT1800, HLT2000, HLT3000, HLT3500, HLT7000, HLT10000

TYPICAL APPLICATIONS

- Consumer electronics
- Telecommunications equipment
- Automotive electronics
- Memory & power modules

Storage & Use

Shelf Life: 6 months (Storage condition on the package for directions)

Availability

Syringes—200+200cc

Jar—1+1gal, 5+5gal

On request

TWO-PART, DISPENSABLE, VERY LOW COMPRESSION FORCE, THERMAL HYBRID

Prior to curing, the material maintains good thixotropic characteristics and low viscosity to be easily dispensed.

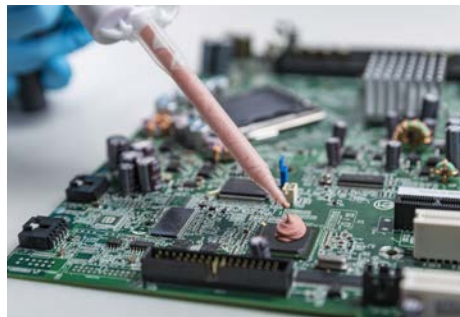
The product can be cured in a short time after two-component mixing at room temperature. The high compressibility minimizes thermal resistance at interfaces, while maintaining excellent performance during reliability testing. Ultra-low volatile versions are available for optical communication and optical module industry.

FEATURES

- Low contact resistance
- Easily to dispense and rework
- High compressibility for low stress applications
- Long-term reliability
- Reduced oil separation
- No pump-out and cracking



The recommended modified viscosity and cure schedule meets large-scale application requirements.



Hybrid thermal interface materials offer a variety of options for dispensing methods, depending on the application.



State-of-the-art two-part Hybrid with high thermal conductivity for high power density applications.

TYPICAL PROPERTIES								
PROPERTY	HLT 1800	HLT 2000	HLT 3000	HLT 3500	HLT 3500LV	HLT 7000*	HLT 10000*	TEST METHOD
Physical Properties								
Color	PartA: Yellow PartB: White	Part A: Yellow Part B: White	PartA: White PartB: Blue	Part A: White Part B: Blue	Part A: White Part B: Red	*	*	Visual
Viscosity (cps)	200,000- 400,000	200,000- 350,000	200,000- 400,000	200,000- 400,000	200,000- 400,000	*	*	ASTM D2196**
Hardness (Shore00)	50	50	50	50	50	50	*	ASTM D2240
Specific Gravity	2.0	2.8	3.1	3.1	3.1	*	*	ASTM D792
Thermal Conductivity (W/m·K)	1.8	2.0	3.0	3.5	3.5	7.0	10.0	ASTM D5470
Thermal Impedance (°C·in²/W) (1mm@10psi, typical value)	0.8	0.75	0.45	0.5	0.44	*	*	ASTM D5470
Curing Time								
25 °C (hour)	18	18	18	18	18	*	*	-
100 °C (minute)	30	30	30	30	30	*	*	-

*Contact Honeywell for latest information. ** Brookfield Viscometer, #7 spindle, 10rpm

GLOBAL SUPPORT

DEVELOPMENT AND MANUFACTURING LOCATIONS

United States

Santa Clara, California
Sunnyvale, California
Spokane, Washington
Chandler, Arizona
Salt Lake City, Utah
Bryan, Texas
Mansfield, Texas
Fombell, Pennsylvania

Europe

Seelze, Germany

Asia

Shanghai, China
Jincheon, Korea
Yaita, Japan
Chonburi, Thailand



▲ Research & Development Site ● Manufacturing Site

HONEYWELL ADVANTAGES

Quality

- Industry-leading reliability over device lifetime
- More than twenty years specializing in TIM materials R&D and manufacturing
- Proprietary formulations optimized for the needs of specific applications
- Proven, long-standing supplier with multiple worldwide quality certifications

Customer Focused

- Serving diverse range of customers
- TIMs offered in a wide range of thermal conductivity and application forms
- Superior global technical support
- Portfolio of other materials, such as thermal spreaders, electrical interconnect pure metals

For More Information

visit <https://industrial.honeywell.com/us/en/products/electronic-materials>

Honeywell Electronic Materials

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Germany: 49.5137.999.9199

Japan: 81.3.6730.7092

Korea: 82.2.3483.5076

Singapore: 65.6580.3593

Taiwan: 886.3.6580300 ext.312

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Brochure 08-2021
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**THE
FUTURE
IS
WHAT
WE
MAKE IT**

Honeywell