

# KEEP COOL – PERFORM BETTER.

Thermal Interface Materials for Today's Electronics

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Portfolio of Products

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**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

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## 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 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
	Thermal Putty Pads	TGP8000	Low Oil Bleeding, Low Outgassing, Low Hardness	8.0
		TGP8000HV	High Breakdown Voltage	8.0
		TGP3500PT	Extra Soft	3.5
		TGP6000PT	Extra Soft	6.0
Thermal Conductivity Electrical Isolation	Thermal Insulators	TGP8000PT	Extra Soft	8.0
		TIP1500	High Breakdown Voltage	1.5
Ease of Application Thin Bondline	Thermal Grease	TIP3500	High Breakdown Voltage	3.5
		TG2000I	Cost Effectiveness, Electrical Isolation	2.0
		TG2800I	Cost Effectiveness, Electrical Isolation	2.8
		TG3000	Cost Effectiveness	3.0
		TG3000I	Cost Effectiveness, Electrical Isolation	3.0
		TG4000	High TC, Low TI	4.0
		TG5500	High TC, Low TI	5.0
Automation Gap Filler	One-Part Hybrid	HT3500	Cost Effectiveness	3.5
		HT5000	Pre-cure, Low Oil Bleeding	5.0
		HT7000	Pre-cure, Low Oil Bleeding	7.0
		HT10000	Pre-cure, Low Oil Bleeding	10.0
Automation Gap Filler	Two-Part Hybrid	HLT2000	Cost Effectiveness	2.0
		HLT2000LV	Low Volatility	2.0
		HLT3500	Cost Effectiveness	3.5
		HLT7000	High Reliability, Easy to Dispense	7.0
		HLT9000	High Reliability, Easy to Dispense	9.0
		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.

## SOLVING INCREASING THERMAL CHALLENGES FOR TODAY AND TOMORROW

Our ongoing investment in research for more advanced materials has resulted in breakthroughs for key applications: thermal interface materials (TIMs) such as phase change materials, and low alpha particle materials for electrical interconnect.

The modern electronics industry is constantly advancing toward higher power consumption and more integrated

functions and miniaturization, resulting in a sharp increase in the power density of modern electronic devices. In fact, we have entered the era of 5G.

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

### 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



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.

# TARGETED MATERIALS

Smartphones and tablets experience sudden temperature spikes, requiring very high thermal performance, 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 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 tablets and smartphones 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 immediate 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. To add to the complexity, chip-scale packages assembled on a PC board 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

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.

### 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

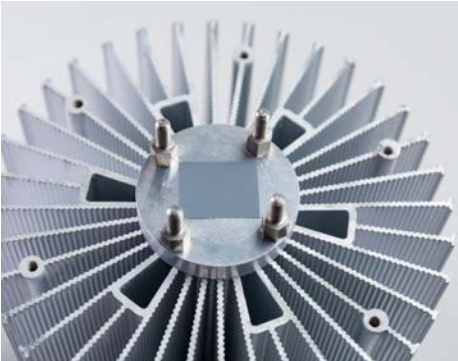
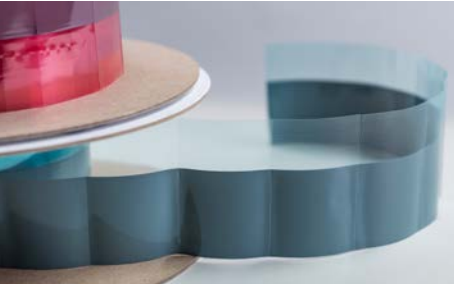
### THERMALLY CONDUCTIVE PHASE CHANGE MATERIAL

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

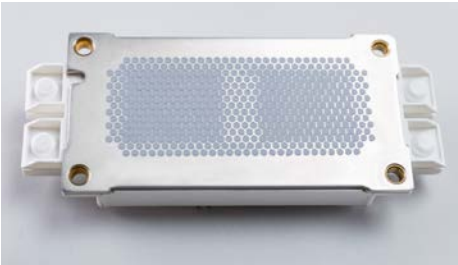
Honeywell offers both pad and paste formats for its thermally conductive PCM. These products were designed to minimize thermal resistance at interfaces and maintain stable performance through the rigorous reliability testing required for long product life applications.

Based on a robust polymer PCM 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.

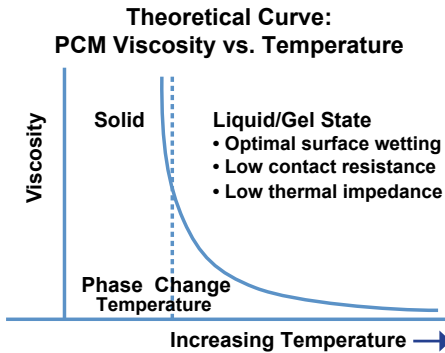


## LTM6300, PCM45F, PTM5000, PTM6000, PTM6000HV, PTM7000, PTM7900, PTM7950

### 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 at 23±2°C

### Availability

PCM material is available in both sheet and roll formats. Stencil printable (SP) material is available in 300cc syringes or 1kg jars.

Thickness Range: 0.2mm–1.0mm (PTM7950 is only available in 0.25mm thickness)

Thickness Tolerance: ±0.075mm

### TYPICAL PROPERTIES

PROPERTY DESCRIPTION	LTM SERIES	PCM45F SERIES	PTM5000 SERIES	PTM6000 SERIES*	PTM7000 SERIES	TEST METHOD
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 Property						
Volume Resistivity (ohm·cm)	3.0×10 <sup>15</sup>	8.2×10 <sup>14</sup>	2.1×10 <sup>14</sup>	2.1×10 <sup>14</sup>	2.1×10 <sup>14</sup>	ASTM D257

\*PTM6000 has higher reliability than PTM5000 Series



# THERMAL GAP PADS

Honeywell Thermal Gap Pads (TGPs) provide high thermal performance with ease of use 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

**TYPICAL APPLICATIONS**

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

**THERMALLY CONDUCTIVE, HIGH COMPRESSIBILITY GAP 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.

**FEATURES**

- High thermal performance
- Ultra-high compressibility for low stress applications
- Excellent surface wetting for low contact resistance
- High reliability
- Electrically insulating



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



The low oil-bleeding property protects components from contamination.



Low hardness provides excellent surface wetting and high compressibility.

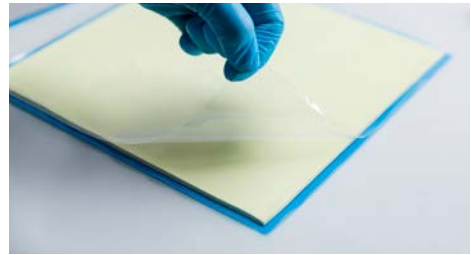
**Storage & Use**

Shelf Life: 12 months at 23±2°C

**Thickness Range:**  
0.5-5.0mm with 0.25mm incremental

**Thickness Tolerance:**  
>1mm, ±10%  
0.5-1mm, ±0.1mm  
<0.5mm, ±0.05mm

Please check thickness availability before ordering.



Two surface liners enable easier handling with less contamination risk.

TGP1200 – TGP8000 TYPICAL PROPERTIES							
PROPERTY	TGP1200	TGP1500	TGP3000	TGP5000	TGP6000	TGP8000	TEST METHOD
Properties							
Color	Blue	Grey	Yellow	Blue	Grey	Grey	Visual
Thickness (mm)	0.5-5	0.5-5	0.5-5	0.5-5	0.5-5	0.5-5	ASTM D374
Hardness (Shore00)	30	40	40	45	40	30	ASTM D2240
Specific Gravity	1.7	1.8	3.1	3.3	3.3	3.4	ASTM D792
Thermal Properties							
Thermal Conductivity (W/m·K)	1.2	1.5	3.0	5.0	6.0	8.0	ASTM D5470
Thermal Impedance (°C·in²/W) (1mm@10psi) <sup>1</sup>	1.03	0.94	0.65	0.3	0.25	0.2	ASTM D5470
Electrical Properties							
Dielectric Constant @1MHz	4.5	5.5	6.6	5.0	8.5	8.3	ASTM D150
Volume Resistivity (ohm·cm)	4.0 x 10 <sup>12</sup>	2.0 x 10 <sup>13</sup>	4.8 x 10 <sup>13</sup>	8.0 x 10 <sup>13</sup>	3.79 x 10 <sup>15</sup>	6.47 x 10 <sup>15</sup>	ASTM D257
Flammability							
Flammability Rating	V-0	V-0	V-0	V-0	V-0	V-0	UL94

<sup>1</sup>Typical Value

TGP8000HV / High Breakdown Voltage

**THERMALLY CONDUCTIVE, HIGH BREAKDOWN VOLTAGE GAP PAD**

TGP8000HV is a Thermal Gap 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-TGP8000 line, TGP8000HV is effective for applications that require high break-down voltage.

TGP8000HV TYPICAL PROPERTIES		
PROPERTY	TGP8000HV	TEST METHOD
Properties		
Color	Grey	Visual
Thickness (mm) <sup>2</sup>	0.5-5	ASTM D374
Hardness (Shore00)	60	ASTM D2240
Specific Gravity	3.5	ASTM D792
Thermal Properties		
Thermal Conductivity (W/m·K)	8.0	ASTM D5470
Thermal Impedance (°C·in²/W) (1mm@10psi) (Typical Value)	0.20	ASTM D5470
Electrical Properties		
Dielectric Strength (V/mm)	8000	ASTM D149
Dielectric Constant @1MHz	8.3	ASTM D150
Volume Resistivity (ohm·cm)	6.47 x 10 <sup>15</sup>	ASTM D257
Flammability		
Flammability Rating	V-0	UL94

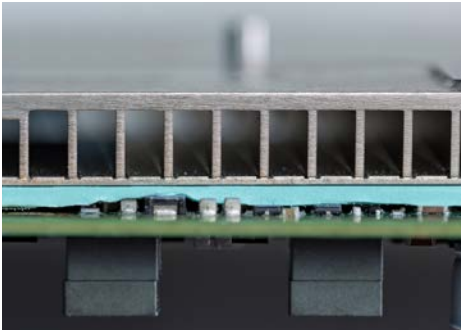
<sup>2</sup> Thickness range: 0.5-5.0mm with 0.25mm incremental  
Thickness Tolerance: >=1mm, ±10%, 0.5-1mm, ±0.1mm

# 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.



## 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.

**Storage & Use**  
Shelf Life: 12 months at 23±2°C

TYPICAL PROPERTIES				
PROPERTY	TGP 3500PT	TGP 6000PT	TGP 8000PT	TEST METHOD
Properties				
Color	Green	Grey	Grey	Visual
Thickness (mm) <sup>1</sup>	0.5-5	0.5-5	0.5-5	ASTM D374
Hardness (Shore00)	5	5	5	ASTM D2240
Specific Gravity	3.2	3.4	3.5	ASTM D792
Thermal Properties				
Thermal Conductivity (W/m·K)	3.5	6.0	8.0	ASTM D5470
Thermal Impedance (°C·in²/W) (1mm@10psi) (Typical Value)	0.45	0.27	0.19	ASTM D5470
Electrical Properties				
Dielectric Constant @1MHz	6.4	6.5	8.5	ASTM D150
Volume Resistivity (ohm·cm)	4.0 x 10 <sup>13</sup>	4.0 x 10 <sup>15</sup>	4.0 x 10 <sup>15</sup>	ASTM D257
Flammability				
Flammability Rating	V-0	V-0	V-0	UL94

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

**FEATURES**

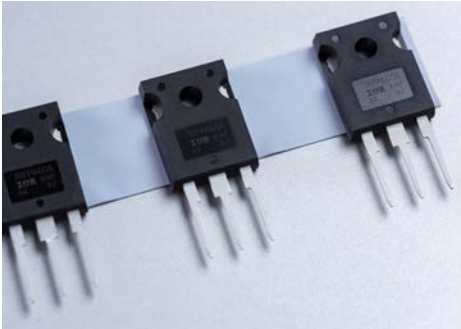
- High thermal performance
- Ultra-soft
- High compressibility
- Excellent gap-filling capability
- Naturally tacky

# THERMAL INSULATORS

The TIP 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 at 23±2°C

**Configurations Available**  
Sheet form and die-cut parts

## TIP1500, TIP3500

**HIGH THERMAL CONDUCTIVITY, ELECTRICAL INSULATION**

TIP1500 combines 1.5 W/m·K, and TIP3500 combines 3.5 W/m·K thermal conductivity, with superior insulation. TIP1500 and TIP3500 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 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	TEST METHOD
Properties			
Color	Pink	Blue	Visual
Thickness (mm) <sup>2</sup>	0.19, 0.23	0.25-0.50	ASTM D374
Hardness (Shore A)	90	80	ASTM D2240
Specific Gravity	2.21	2.47	ASTM D792
Thermal Properties			
Thermal Conductivity (W/m·K)	1.5	3.5	ASTM D5470
Thermal Impedance °C·in²/W @10psi (typical value)	0.91@0.19mm 0.93@0.23mm	0.23	ASTM D5470
Thermal Impedance °C·in²/W @50psi (typical value)	0.54@0.19mm 0.61@0.23mm	0.18	ASTM D5470
Electrical Properties			
Dielectric Breakdown Voltage (V)	>6000	>6000	ASTM D149
Dielectric Constant @1MHz	5.50	3.30	ASTM D150
Volume Resistivity (ohm·cm)	1 x 10 <sup>13</sup>	5 x 10 <sup>13</sup>	ASTM D257
Flammability			
Flammability Rating	V-0	V-0	UL94

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

# THERMAL GREASE

Honeywell silicone 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.

### TYPICAL APPLICATIONS

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

### 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. Thermal interface materials occupy the space of air (a very poor thermal conductor) and fill in the gaps between two solid surfaces. This establishes an effective thermal path between a heat-generating component and a heat sink attached to it, therefore greatly increasing thermal transfer efficiency.

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. TG series products 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 stencil/screen 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

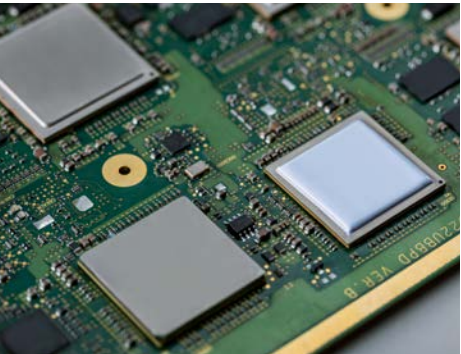
### Storage & Use

Shelf Life: 12 months at 23±2°C



Honeywell thermal grease remains stable under room temperature storage.

### TG2000I, TG2800I, TG3000, TG3000I, TG4000, TG5500



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



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

### TYPICAL PROPERTIES

PROPERTY	TG2000I	TG2800I	TG3000	TG3000I	TG4000	TG5500	TEST METHOD
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·in²/W) (35psi, 50 °C)	0.020	0.009	0.009	0.003	0.005	0.010	ASTM D5470
Electrical Properties							
Dielectric Constant @1MHz	>6	>14	>10	>10	>10	>10	ASTM D150
Volume Resistivity (ohm·cm)	1.0 x 10 <sup>13</sup>	1.3 x 10 <sup>13</sup>	1.0 x 10 <sup>12</sup>	2.0 x 10 <sup>12</sup>	1.0 x 10 <sup>12</sup>	1.0 x 10 <sup>12</sup>	ASTM D257
Flammability							
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	-

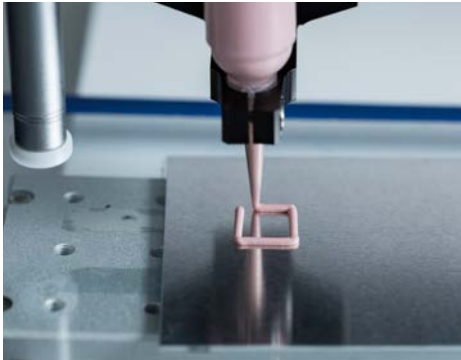


# THERMAL ONE-PART HYBRID

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

### TYPICAL APPLICATIONS

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



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

### 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
- Requires no mixing, additional curing or low temperature storage

### 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 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.).

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.

### HT3500, HT5000, HT7000, HT10000

TYPICAL PROPERTIES					
PROPERTY	HT3500	HT5000	HT7000*	HT10000*	TEST METHOD
Feature	Silicone-based	Silicone-based	Silicone-based	Silicone-based	-
	Pre-cured	Pre-cured	Pre-cured	Pre-cured	-
Color	Dark Red	Grey	*	*	Visual
Specific Gravity	3.2	3.4	*	*	ASTM D792
Thermal Conductivity (W/m·K)	3.5	5.0	7.0	10.0	ASTM D5470
Thermal Impedance (°C·cm²/W)	<0.35	<0.25	*	*	ASTM D5470 at BLT
Minimum BLT (mm)	0.10	0.05	*	*	-
Dispense Rate (g/min)	>10	>10	*	*	90psi, 30cc EFD syringe
Out Gassing (TML)	<0.5%	<0.5%	*	*	ASTM E595
Storage Condition	RT	RT	*	*	-
Shelf Life (months)	12	12	*	*	-

\*Contact Honeywell for latest information.



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.



# THERMAL TWO-PART HYBRID

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

HLT2000, HLT2000LV, HLT3500, HLT7000, HLT9000, HLT10000

**TYPICAL APPLICATIONS**

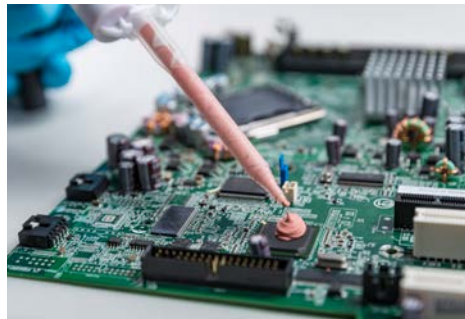
- Consumer electronics
- Telecommunications equipment
- Automotive electronics
- Memory & power modules

**Storage & Use**  
Shelf Life: 6 months at 23±2 °C

**Availability**  
Syringes—200+200cc  
Jar—1+1gal, 5+5gal  
On request

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

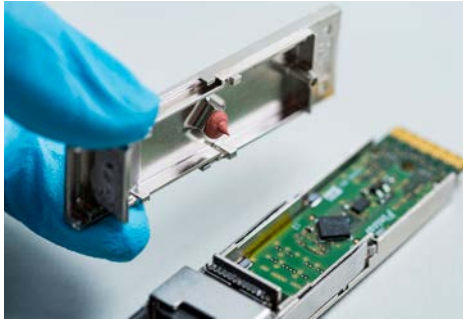
Prior to curing, the material maintains good thixotropic characteristics and low viscosity to be easily dispensed. The product can be cured in a short time after two-component mixing at room temperature. The high compressibility minimizes thermal resistance at interfaces, while maintaining excellent performance during reliability testing.



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

**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



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

TYPICAL PROPERTIES							
PROPERTY	HLT 2000	HLT2000LV	HLT 3500	HLT 7000*	HLT 9000*	HLT 10000*	TEST METHOD
Properties							
Color	Part A: Yellow Part B: White	Part A: White Part B: Dark Red	Part A: White Part B: Blue	*	*	*	Visual
Viscosity (cps)	200,000–350,000	200,000–400,000	300,000–450,000	*	*	*	ASTM D2196**
Hardness (Shore00)	50	35	40	*	*	*	ASTM D2240
Specific Gravity	2.8	2.8	3.2	*	*	*	ASTM D792
Thermal Properties							
Thermal Conductivity (W/m·K)	2.0	2.0	3.5	7.0	9.0	10.0	ASTM D5470
Thermal Impedance (°C·in²/W) (1mm@10psi, typical value)	0.66	0.60	0.44	*	*	*	ASTM D5470
Cure Schedule							
25 ° C (hour)	10	16	12	*	*	*	–
100 ° C (minute)	30	30	30	*	*	*	–

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



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

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 and pure metals

#### **For More Information**

electronicmaterials.com

#### **Honeywell Electronic Materials**

USA: 509.252.2102

China: 400.840.2233

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 \_\_\_\_\_  
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FUTURE  
IS  
WHAT  
WE  
MAKE IT**

**Honeywell**