Thermal Compound Selection Guide

Silicone-Free Thermal Interface Material

Thermal compound can be packaged in any size Nordson EFD syringe barrel or cartridge along with 6 oz jars and 1 and 5 gallon pails.

Thermal Interface Material (TIM) is any material used to enhance thermal coupling between two parts. TIM may be known by any number of names including thermal compound, thermal grease, thermal gel, heat sink compound, CPU grease, gap filler, and thermal paste. Each is formulated to provide an advantage in specific use conditions. Depending on the materials used, unit price varies from inexpensive to quite high for premium performance.

When two surfaces are placed in contact, surface imperfections cause contact to occur at discrete points, with a relatively low percentage of the nominal area making contact. Thermal compounds are intended to conform to surfaces, filling in the space between discrete contact points. This creates an uninterrupted, thermally-conductive path between surfaces, delivering far better heat-carrying capacity than contact points alone.

Mechanics of Heat Transfer

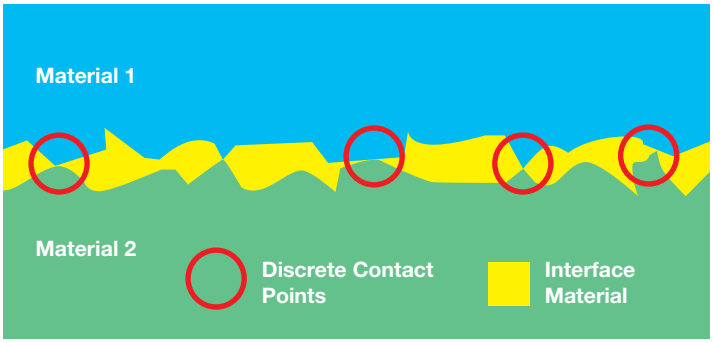
Choosing the best thermal compound requires some understanding of the mechanics of heat transfer and how the thickness of the thermal compound layer, the bond line thickness, influences product choice.

Bond line can be divided into three categories:

- Low, at less than 75 µm
- Medium, from 75 to 250 µm
- High, at greater than 250 µm

There are two critical thermal performance characteristics: Thermal Conductivity (TC) and Thermal Resistance (TR). In low bond line applications, thermal resistance dominates performance. In high bond line applications, thermal conductivity dominates performance. In medium bond line there is a blended influence.

Figure 1. Thermal Conductivity



How thermal compound (interface material) creates an uninterrupted, thermally-conductive path between two materials.

Thermal Conductivity (TC)

TC is a measurement of heat transfer between Material 1 and Material 2, expressed in units of W/mK (see Figure 1). The thicker the layer of thermal compound, the greater the influence of thermal conductivity. Examples: copper 385, steel 50.4, glass 0.80, TIM 0.6-8.0, and wood <0.12.

Thermal Resistance (TR)

TR is a measurement of temperature drop across an interface of materials, expressed as °C/W. Thermal compounds that have the best wetting and filler structure can have exceptionally low thermal resistance with moderate thermal conductivity. In low and medium thickness applications this lower thermal resistance can greatly enhance heat transfer because thermal coupling is more efficient.

more info

Nordson EFD

Formula	SPECIFICATIONS					
	52022	52054	52055*	52050	52160	53053
Specific Gravity at 25° C	2.7	3.0	2.8	2.6	2.6	2.8
Bleed: 24 Hrs., % Weight	0.1	0.01	0.01	0.01	0.3	0.5
Evaporation: 150C, 24 Hrs., % Weight	0.15	<2.0	1.0	0.6	0.5	0.5
Thermal Conductivity: W/m-K	0.92	1.3	1.3	3.8	2	3.5
Dielectric Strength: V/mil	305	265	265	351	n/a	318
Dielectric Constant: 25° C, 1000Hz	4.5	5.02	5.02	4.92	n/a	5
Dissipation Factor: 25° C, 1000Hz	0.0029	0.0022	0.0022	0.0032	n/a	0.0027
Volume Resistivity: Ohm-cm	1.65x10^14	2.0x10^15	2.0x10^15	1.0x10^13	over current	2.15x10^15
Operating Temperature: ° C	-40 to 200	-40 to 180	0 to 180	-40 to 200	-40 to 200	-40 to 200
Flow Rate: g/min	4 to 7	8 to 9	4.5 to 6.5	1 to 3	3 to 8	7 to 9
Minimum Bond Line: mm	0.0381	0.0127	0.0127	0.0508	0.0254	0.1270
Viscosity: 25° C kCps	460	470	620	350	230	1000
Viscosity: 50° C kCps	400	410	550	60	170	400
Appearance	Smooth, off-white paste	Smooth white paste	Smooth white paste	Dark gray paste	Smooth, gray paste	Off white paste
Shelf Life	1 year	1 year	1 year	1 year	1 year	1 year

*Water cleanup for easy clean up

Nordson EFD

For Nordson EFD sales and service in over 40 countries, contact Nordson EFD or go to www.nordsonefd.com.

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