

# THERMALLY CONDUCTIVE COMPOUNDS

Heat Transferring Thermoplastics From RTP Company

## Quick Information

- ▶ Dissipate Heat Through Plastic Compounds
- ▶ Consolidate Parts And Reduce Weight
- ▶ Resist Chemicals Better Than Metals
- ▶ Select Electrically Conductive Or Electrically Insulative Grades

Imagine a thermoplastic compound that transfers heat away from sensitive electronic components. One that increases design freedom over metals by consolidating parts and reducing costs. At RTP Company, we not only imagined it, we've brought it to market.

While metals have higher thermal conductivity values than plastics, much of their effectiveness can be lost. Air movement (or convection) actually determines how quickly heat is removed from an electrical system. Designs with minimal or insufficient convection may not fully utilize the thermal conductivity of metals. In these cases, Thermally Conductive Compounds (TCC's) offer a better balance of cost, performance, and processing ease.

TCC's are lightweight and economical to process by injection

molding or extruding into sheet or tape. They have good chemical resistance, offering an excellent alternative to metal heat exchangers that have failed due to corrosion. Fillers in the compound reduce "hot spots" by absorbing and distributing heat more evenly than unfilled resins.

TCC's are specified in the computer, aerospace, automotive, electronic, and appliance industries for applications such as heat exchangers and coolers, heat sinks and heat pipes, electronic interfaces, housings, and transformers.

Thermally Conductive Compounds from RTP Company...another innovation from the leader in specialty compounding.



### World Headquarters:

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**The Leader in Specialty Compounding**

### Manufacturing Facilities:

Winona, MN  
South Boston, VA  
Fort Worth, TX  
Indianapolis, IN  
Beaune, France  
Singapore



**Coming 2005**  
Suzhou, China

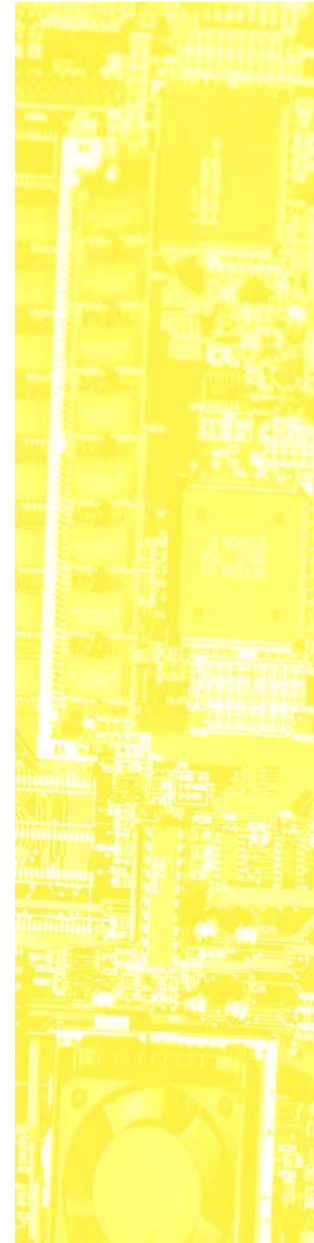
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## Thermal Conductivity of Polymers

(Higher values provide more effective heat transfer.)

| Polymers  | Metric<br>(W/m <sup>2</sup> K) | English<br>(BTU in/hr ft <sup>2</sup> °F) |
|---|--------------------------------|---|
| Standard Plastic Compounds                                | 0.2 - 0.8                      | 1.4 - 5.6                                 |
| Electrically Insulative Plastic Compounds (through-plane) | 0.8 - 2.5                      | 5.6 - 17.4                                |
| Electrically Insulative Plastic Compounds (in-plane)      | 0.8 - 6.0                      | 5.6 - 41.6                                |
| Electrically Conductive Plastic Compounds (through-plane) | 0.8 - 5.0                      | 5.6 - 34.7                                |
| Electrically Conductive Plastic Compounds (in-plane)      | 0.8 - 30.0                     | 5.6 - 208.2                               |

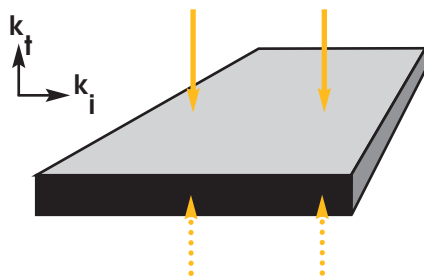


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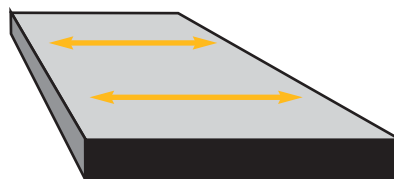
## Thermal Conductivity Can Be Orientation Dependent

The thermal conductivity (k) of thermoplastic compounds can be orientation dependent when high aspect ratio thermally conductive fillers are used. Such high aspect ratio fillers (i.e. fibers, flakes, etc.) tend to align with polymer flow during part molding. This orientation can result in non-isotropic thermal conductivity, as displayed where values in-plane tend to be higher than through-plane — typically three-to-one, five-to-one, or even higher. *Higher in-plane values can be beneficial in applications that require rapid dissipation of heat away from a single point heat source.*

### • Through-Plane Testing (t)



### • In-plane Testing (i)



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