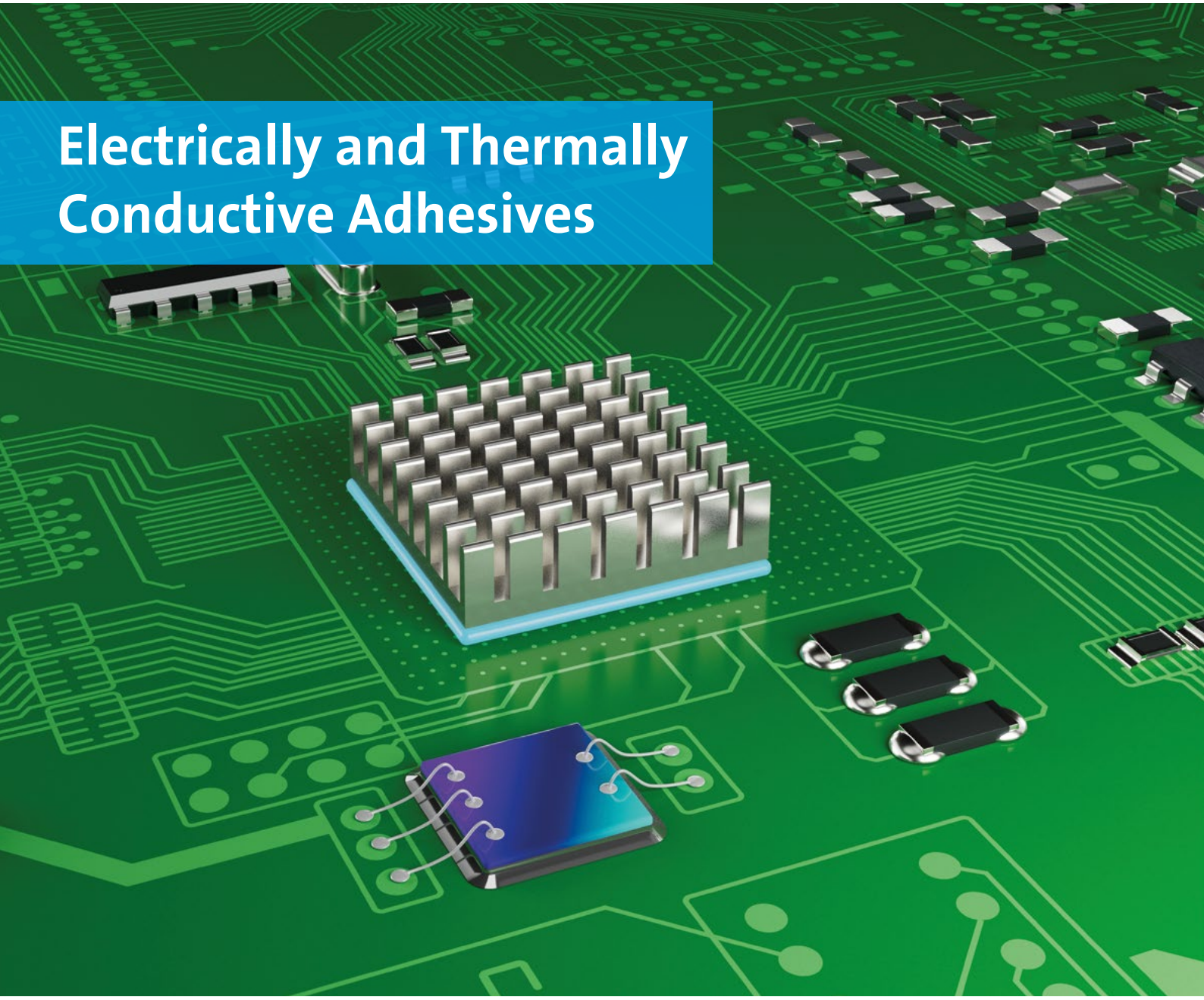
hönle group

panacol adhesives & more

Electrically and Thermally Conductive Adhesives

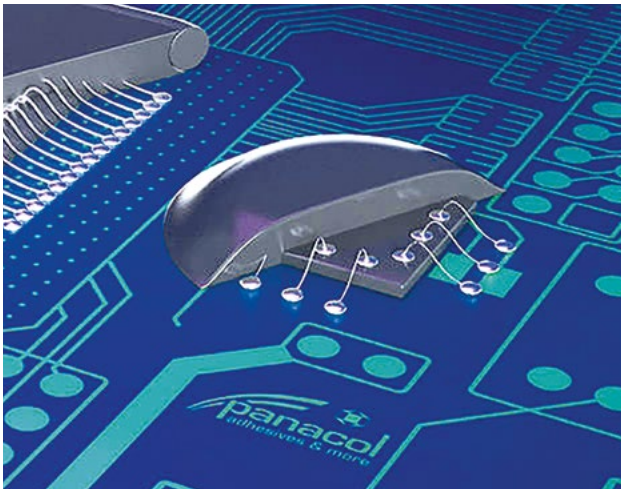


Adhesive Bonding Instead of Soldering:
Bonding Electrical Connections

Die Attach
Sensor Bonding
Thermal Management

Thermal Management

Electronic components and devices are getting smaller and more powerful, which increases their thermal load. This can shorten their lifetime and reduce their performance. In many applications, such as computer and sensor technology or the manufacture of high-performance batteries, efficient heat dissipation combined with electrical insulation is required. In addition to these properties, adhesives offer form-fit and mechanically stable lightweight construction.



Benefits of adhesives compared to other processes:
Thermal dissipation with simultaneous mechanical fastening and form-fit connection of different components

- High ionic purity
- Good media resistance
- Solvent-free
- High adhesion

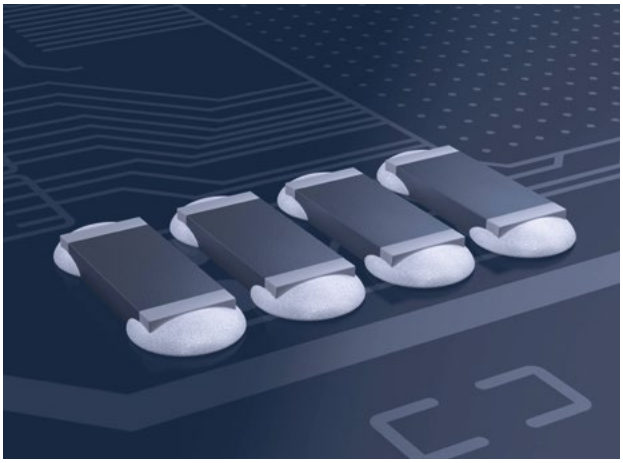
Panacol offers a wide range of thermally conductive adhesives: The portfolio covers 1- and 2-component adhesives with different curing conditions. The adhesives are suitable for applications at temperatures between -40 and 200°C.

Thermally conductive adhesives

Adhesive	Typical application (areas of application)	Viscosity [mPas]	Thixo-Index	Base	Curing	[W/mK] Values	Properties
Elecolit® 6207	Sensor bonding, potting compounds	9,000 - 12,000 (Mix)	1.4 - 1.5	2-part epoxy	RT/thermal	0.9 - 1.1	Flammability category according to UL-94: V0
Elecolit® 6601	Sensor bonding, potting compounds	12,000 - 20,000 LVT, Sp. 4/6 rpm	1.3 - 1.5	1-part epoxy	thermal	0.7 - 0.9	Excellent adhesion to metals, high strength
Elecolit® 6603	Sensor bonding, potting compounds, automtive	20,000 - 40,000 Rheometer, $10s^{-1}$	1.4 - 2.4	1-part epoxy	thermal	1.2 - 1.4	Excellent adhesion to metals, highly resistant to vibrations and temperature shock
Elecolit® 6604	Magnet and heat sink bonding	55,000 - 75,000 Rheometer, $10s^{-1}$	1.2 - 1.7	1-part epoxy	thermal	0.9 - 1.1	Excellent adhesion to metals
Elecolit® 6607	Sensor, magnet and heat sink bonding	50,000 - 65,000 Rheometer, $5s^{-1}$	1.6 - 1.7	1-part epoxy	thermal	0.8 - 1.0	Low coefficient of thermal expansion (CTE), curing from 80°C
Elecolit® 6608	Potting compounds, automotive	95,000 - 105,000 Rheometer, $10s^{-1}$	1.2 - 1.4	1-part epoxy	thermal	1 - 1.2	Flammability category according to UL-94: V0, High thermal resistance Tg = 140°C
Elecolit® 6616	Sensor, magnet and heat sink bonding	50,000 - 120,000 Rheometer, $10s^{-1}$	2 - 3	2-part epoxy	RT/thermal	0.9 - 1.1	Very high dielectric strength (> 30 kV/mm)
Vitralit® E-1671 T	NTC Glob Top	40,000 - 55,000 Rheometer, $10s^{-1}$	8.5 - 10	1-part epoxy	UV/thermal	0.7 - 0.9	Stable, high thermal resistance, high Tg

Creating Electrical Connections

Miniaturization and condensed power are highly advanced and extremely relevant in electronics and electrical engineering. Precise dispensing in complex component geometry, fast curing and ultimately a form-fit and long-lasting material connection are essential. Low curing temperatures, low electrical resistance and reliable performance on flexible, temperature-sensitive substrates are in demand and do not align with classic soldering processes.



Benefits of adhesives compared to other processes:

- Application by screen printing & jetting possible
- Fast curing (snap cure) and thermode curing (hot press) can be realized
- Flexible, mechanical & temperature-stable connection
- High ionic purity (corrosion-resistant)

Electrically conductive adhesives from Panacol are characterized by low shrinkage, good adhesion to printed circuit boards (PCBs) and metals (copper, silver), as well as high chemical, mechanical and thermal resistance. The adhesives are suitable for applications at temperatures between -40 and 200°C.

Electrically conductive adhesives

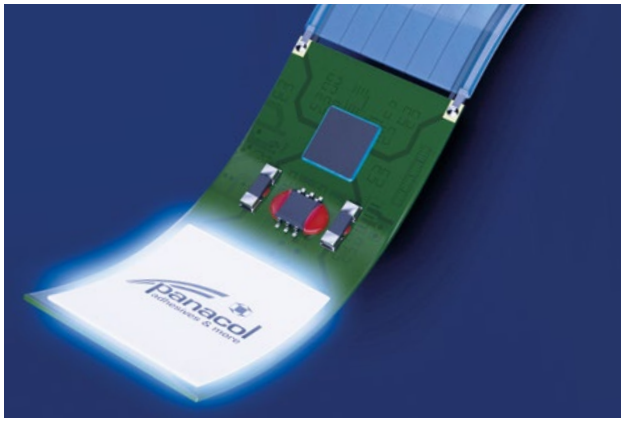
Adhesive	Typical application (areas of application)	Viscosity [mPas]	Base	Curing	[W/mK] Values	Volumen-resistance in Ω • cm	Properties
Elecolit® 3025	Heat-sensitive components	80,000 - 90,000 Rheometer, $10s^{-1}$	2-part epoxy	RT/thermal	> 1.6	10^{-3}	Curing at room temperature
Elecolit® 3043	Automotive sensors	1,500 - 3,500 Rheometer, $10s^{-1}$	1-part epoxy	thermal	1.8 - 2.2	10^{-4}	Excellent flow behavior, low viscosity
Elecolit® 3647-1	(Organic) photovoltaics	7,000 - 12,000 Rheometer, $10s^{-1}$	1-part epoxy	thermal	4 - 5	10^{-4}	Very flexible, particularly suitable for foil substrates (flex PCB, metallic foils)
Elecolit® 3648	(Organic) photovoltaics, die attach	10,000 - 15,000 Rheometer, $10s^{-1}$	1-part epoxy	thermal	3 - 4	10^{-4}	Suitable for foil substrates (flex PCB, metallic foils), curing by thermode, curing from 80°C
Elecolit® 3653	Powertrain, Automotive sensors	4,000 - 8,000 Rheometer, $10s^{-1}$	1-part epoxy	thermal	1.8 - 2.2	10^{-3}	Suitable for flexible substrates
Elecolit® 3655	SMD Packaging, LED die attach	5,000 - 15,000 Rheometer, $10s^{-1}$	1-part epoxy	thermal	8.5 - 9.5	10^{-4}	High glass transition temperature (Tg - 150°C), high ionic purity (semiconductor grade)
Elecolit® 3656	SMD Packaging, LED die attach	50,000 - 70,000 Rheometer, $10s^{-1}$	1-part epoxy	thermal	3.5 - 4.5	10^{-3}	Stable, high dimensional stability, suitable for jetting
Elecolit® 3661	Flexible circuit boards, die attach	20,000 - 40,000 Rheometer, $10s^{-1}$	1-part epoxy	thermal	1.8 - 2.2	10^{-3}	Stable, high dimensional stability
Elecolit® 3662	Power modules	45,000 - 55,000 Rheometer, $10s^{-1}$	1-part epoxy	thermal	5 - 6	10^{-5}	Very good electrical conductivity, suitable for jetting, low abrasiveness
Elecolit® 323	Medical devices	paste-like	2-part epoxy	thermal	3.8 - 4.2	10^{-4}	Biocompatible, certified according to ISO 10993-5, high ionic purity (semiconductor grade)
Elecolit® 325	Aerospace	paste-like	2-part epoxy	RT/ thermal	2.8 - 3.2	10^{-3}	Minimal stringing, low volume resistance during RT curing
Elecolit® 336	MV-protect./discharge, electronic contacting	pastös	2-part-epoxy	RT/thermal	2.8 - 3.2	10	Good conductivity values at room temperature curing
Elecolit® 342	ESD protection, Contacting of heating elements menten	1,000 - 2,000 Rheometer, $20s^{-1}$	1-part acrylate	RT/thermal	1.8 - 2.2	10^{-3}	Small particle size
Elecolit® 414	Aerospace	6,000 - 15,000 Rheometer, $10s^{-1}$	1-part polyester	thermal	3 - 4	10^{-4}	Flexible, very high chemical resistance

Application Examples

Die Attach

Die Attach is one of the most important processes in the assembly of microelectronic components. In this process, a semiconductor component (e.g. microprocessor) is attached to a circuit carrier (e.g. a PCB). Electrically conductive adhesives offer the advantage of combining form-fit mechanical stability, electrical contacting and thermal conductivity. This decisively optimizes the efficiency/performance and reliability of the entire component. Adjustable flow properties enable precise dispensing via screen printing or jetting.

Due to their flexibility and low curing temperatures, electrically conductive adhesives are particularly suitable for flexible and temperature-sensitive substrates (flex PCBs). Nevertheless, they exhibit high chemical, mechanical and thermal resistance (e.g. for reflow processes).



Thermally Conductive Potting

Thermally conductive adhesives are chemically curing systems that have, in uncured condition, a low viscosity and very good flow properties. This enables precise dispensing, flow of the adhesive into cavities and gaps and good surface wetting with form-fit gap bridging, which compensates for unevenness in the surfaces of the parts to be joined. A properly selected adhesive not only ensures the dissipation of heat, but also offers high bond strength between a wide variety of materials and dissimilar substrates.

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