



THERMAL MANAGEMENT SOLUTIONS OF TOMORROW



Global Graphene Group
is on the cutting edge
for effective thermal
management in today's
compact electronic
equipment and devices.

THERMAL MANAGEMENT SOLUTIONS

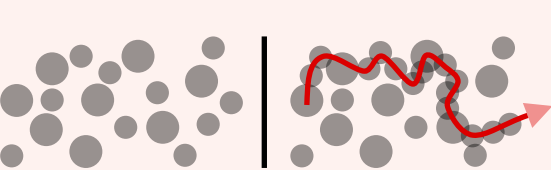
When it comes to thermal management solutions, G³ has the answers. G³ leverages graphene's extremely high, in-plane thermal conductivity (5,300 W/m·K vs. crystalline flake graphite 2,200 W/m·K) into our thermal management solutions, including heat spreader (AT1500) and thermal paste. See specifications on our paste and heat spreader below.

As the world's largest producer of graphene, these solutions can be obtained at a much lower cost than other producers or other solutions. Our scale also provides both affordability and availability.

GRAPHENE THERMAL PASTE

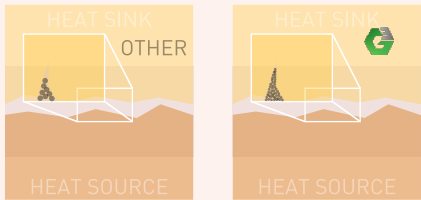
G³ thermal paste uses graphene as filler, providing high thermal conductivity in a non-metallic formulation. G³ developed the silicon-free graphene thermal paste to meet manufacturers' and users' end-need while maintaining high performance and excellent coating characteristics.

Properties	Units	Ge-TH-G000	Ge-TH-G030	Ge-TH-G040	Ge-TH-G042
Thermal Conductivity	W/m·K	2	5	> 6	> 6
Specific Gravity	g/cm ³	2.05	2.05	3.8 ± 0.2	3.8 ± 0.2
Working Temperature	°C	0 - 130	0 - 130	-40 - 150	-40 - 150



Connectivity of Thermal Interface

Left: There is no interparticle contact.
Right: Thermally conductive materials are connected to each other.



Graphene Is Easier To Fill Micro Gaps

Left: Typical thermally conductive material particles. Their larger size limits penetration into microvoids.
Right: Graphene can penetrate deeper into micro-pores due to its nanostructure.

The benefits of micro-grade graphene thermal paste include easily filling the interstitial regions of micro devices and improved coating characteristics to enhance ease of applications.

GRAPHENE HEAT SPREADER

G³'s graphene heat spreader, AT1500, offers a significant advancement to current heat spreading materials. The AT1500 series of heat spreaders comes in many thickness options from 20 to 100 μm . G³ has roll-to-roll manufacturing capabilities for free standing and PET backed AT1500.

FEATURES

- High thermal conductivity (1,200 to 1,700 $\text{W/m}\cdot\text{K}$) depending on thickness
- EMI shielding benefits
- Easily cut and laminated
- Lightweight and non-combustible
- Flexible and usable on uneven surfaces

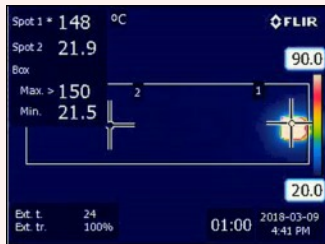
APPLICATIONS

- 3C industry
- Large screen display
- LED lighting

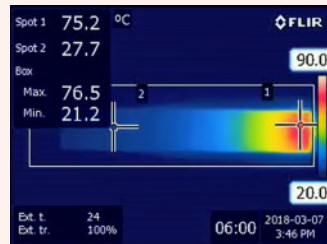


AT1500 heat spreader

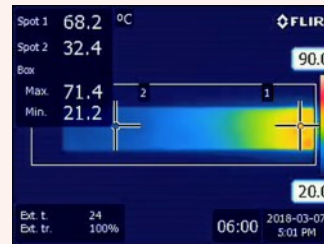
TECHNICAL DATA



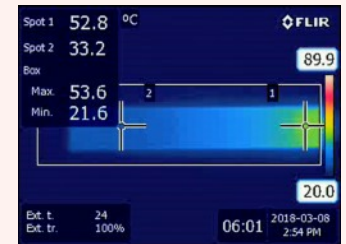
Heater with no spreader



PGS-40 μm



AT1500-40



AT1500-90

- Heat spreader sample size: 20mm x 120mm
- Heater size: 10mm x 10mm
- Test condition: 7V - 0.28A - 2W heating

AT1500-40 reduces maximum temperature by 4.1°C more than PGS-40 and improves heat uniformity indicating more heat conductance from the heat source. AT1500-90 shows best heat dissipation as it reduces heat source temperature 18.6°C more than AT1500-40.

TYPES OF AT1500

F		Heat spreader		<ul style="list-style-type: none">Free standing sheetsFlexibleHigh thermal conductivity
L		Heat spreader Release Coating PET Film		<ul style="list-style-type: none">PET backing on one side
LP		Heat spreader One-sided adhesive PET Film		<ul style="list-style-type: none">PET backing on one sideWeak bonding
LX		PET One-sided adhesive Heat spreader Two-sided adhesive Release Film		<ul style="list-style-type: none">Insulating material on both sides



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Our co-founders, Dr. Bor Z. Jang and Dr. Aruna Zhamu, are technological pioneers in the graphene industry and together have added over 300 graphene-related patents and patent applications to the G³ portfolio.

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