

Common Thermal Glue Issues and How to Resolve Them

In modern electronics manufacturing, thermal glue plays a crucial role in both thermal management and structural bonding. Unlike traditional thermal interface materials such as thermal paste or thermal gap fillers, thermal glue provides a permanent connection between components while simultaneously transferring heat.



This dual function makes thermal glue especially valuable in applications such as:

- LED Modules
- Power Electronics
- Industrial Control Equipment
- Lithium Battery Packs
- Automotive Electronics

In modern technology, due to the technological strains and performance pressures, thermal glue needs to be more than a simple adhesive. It has to be a structural device, provide a thermal path and also act as a vibration damper. Our TCG200 series is able to meet all three of these requirements. There are however some common issues that engineers face when trying to use thermal conductive adhesive. Below are some examples of problems faced, and solutions to overcome these issues.

Problem 1 – Poor Thermal Performance

Common Symptoms

One of the most common issues engineers encounter with thermal conductive glue is inefficient heat transfer.

Signs of poor thermal performance include:

- Electronic components running hotter than expected.
- Heat sinks remaining relatively cool.
- Uneven temperature distribution across components.

In many cases engineers initially suspect that the adhesive itself has poor thermal conductivity. The problem is often related to how the thermal adhesive was applied. Several factors can increase thermal resistance in the adhesive layer that prevent the thermal glue from transferring heat:

Cause	Effect
Adhesive layer too thick	Heat must travel on a longer path
Air bubbles in adhesive	Air blocks heat transfer
Uneven spreading	Inconsistent thermal contact
Dirty bonding surfaces	Reduced thermal efficiency

Air pockets are particularly problematic because air is a very poor conductor of heat. Even small bubbles trapped in the adhesive layer can significantly reduce thermal performance.

How to Fix Poor Thermal Conductivity

To improve heat transfer, consider the following steps:

1) Control Adhesive Thickness

Thermal glue should form a thin, uniform layer between surfaces.

2) Use Proper Dispensing Patterns

- Dot pattern for small chips.
- Line pattern for heat sinks.
- Cross pattern for larger surfaces.

3) Apply even pressure during assembly

- Pressure spreads the adhesive and helps remove trapped air.

4) Ensure clean bonding surfaces

- Remove dust, oil and oxidation using isopropyl alcohol and lint free wipes.

Problem 2 – Weak Bonding Strength

One issue engineers face is when the heat sink detaches itself from the PCB or electronic device unexpectedly. This is due to a poor adhesion quality between the heat sink and device. Common sources of this issue include foreign bodies such as finger oils, dust and release agents which can all act as a non-stick agent. Another issue is CTE mismatch; if your heat sink expands faster than your silicone chip, a rigid glue will eventually snap under the expansion constraints.

To avoid such a situation, we advise treating the surface with a 99% Isopropyl Alcohol (IPA) scrub.

Problem 3 – Uneven Thermal Glue Spreading

If you pull apart a failed assembly and the glue looks messy, then there is a coverage problem. Uneven glue coverage creates thermal hot spots where the silicone starts to cook itself. Uneven distribution can lead to inconsistent heat transfer and unreliable bonding.

Why uneven spreading causes thermal hotspots

When adhesive coverage is uneven, some areas may have:

- Thick adhesive layers
- Trapped air pockets
- Insufficient contact between surfaces

These inconsistencies create thermal hot spots where heat accumulates instead of being dissipated.

Common Dispensing Mistakes

Mistake	Result
Incorrect dispensing pattern	Poor coverage
Misaligned components	Uneven adhesive layer
Insufficient mounting pressure	Thick adhesive spots

Best Dispensing Patterns for Thermal Glue

Pattern	Best Use
Dot pattern	Small electronic components
Line pattern	Heat sinks or elongated surfaces
Cross pattern	Large modules

Rely on the compressibility of the glue and use a centre dot or x-pattern. Let the mechanical pressure of the mounting process push the glue from the centre outwards. This ensures any air is pushed out.

Problem 4: Adhesive Overflow and Excess Glue

Applying too much thermal glue is another common issue, especially in manual assembly process.

Why Applying too Much Thermal Glue is a Problem

Excess adhesive can cause several complications:

- Overflow around component edges.
- Contamination of nearby circuitry.
- Thicker adhesive layers that reduce thermal efficiency.

Although it may seem better to apply extra adhesive, excessive glue reduces heat transfer performance.

Common Causes of Overflow

Cause	Effect
Excess dispensing volume	Adhesive leakage
High mounting pressure	Glue pushed out of interface
Poor dispensing control	Inconsistent application

How to Control Adhesive Volume

To prevent overflow:

- Calibrate dispensing regularly
- Use controlled syringe or automated dispensing systems
- Perform small test applications before full production.

Automated dispensing equipment is often preferred in high volume manufacturing because it ensures consistent adhesive qualities and placement.

Problem 5: Curing Failures

After a long time (24 hours+), the glue is still tacky or the heat sink moves when it is poked. The glue has remained in a liquid state.

Signs of Incomplete Curing

- Adhesive surface remains sticky
- Components shift after bonding
- Adhesive deforms under mechanical stress

These symptoms indicate that the curing process has not completed properly.

Common Curing Mistakes

Cause	Effect
Incorrect mixing ratio	Incomplete chemical reaction
Low curing temperature	Slow curing process
Insufficient curing time	Weak adhesive structure

How to Ensure Proper Adhesive Curing

- Maintain appropriate temperature conditions.
- Allow sufficient curing time before applying mechanical stress.

In some manufacturing environments, heat curing is used to accelerate the process and improve efficiency.

Problem 6: Difficult Rework

Thermal glue is designed to provide a permanent bond; however, this also causes major rework issues.

Safe Methods for Removing Thermal Glue

Method	Description
Heat softening	Heating reduces adhesive strength
Mechanical separation	Carefully prying components apart
Chemical solvents	Used in limited cases

Even with these techniques, there is a risk of damaging components or surfaces during removal.

When Rework is Possible

Rework may be feasible when:

- Components are large and durable
- The adhesive layer is relatively thin
- Sufficient heating equipment is available

In many cases, however, replacing the bonded components may be more practical.

FAQs

Can I use TCG200 for high power EV battery modules?

Absolutely. It is an ideal solution due to its flammability rating (UL 94-V-0) and “one step” simplicity. Please allow 24 hours for the material to fully cure and reach its correct structure.

Is thermal glue better than thermal paste?

They have different advantages in different application scenarios, so the choice between thermal paste and thermal glue depends entirely on the customer’s intended use.

Does thermal glue “pump” out over time?

Unlike paste, cured glue is a cross-linked solid. It stays exactly where you put it, making it the perfect choice for high-vibration automotive electronics.

Can thermal glue be removed?

Once cured, thermal glue is difficult to remove and typically requires heat and mechanical separation.