

Complete support to

# “High Heat Resistant and High-Strength”

that power device requires to the bonding material

Alconano Nano-Silver Paste

# Alconano®

 **NIHON SUPERIOR®**

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 **NIHON SUPERIOR®**

Committed to utilizing "environmentally friendly" manufacturing methods that do not emit any environmentally hazardous substances during production

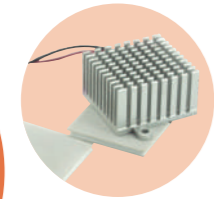
## SUSTAINABLE DEVELOPMENT GOALS

Alconano Nano-Silver Paste is a clean bonding material that does not emit any environmentally hazardous substances during production. We are also working to recycle the raw waste materials that are generated during the manufacturing process.



### Thermo-electric element

Thermo-electric elements are required to operate under high temperature. Alconano, which has excellent heat resistance, is suitable for bonding together these special products.



### IPM Intelligence Power Module

Ideal for bonding inverters that are used in trains and elevators that operate at high efficiency and high loads, and for bonding power modules that require high thermal conductivity and high electrical conductivity.



### Alconano featured here

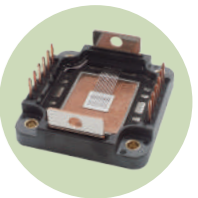
### High luminance LEDs

High luminance LEDs are required to generate a large amount of heat. This is one of the products where the performance of Alconano with its excellent heat resistance properties can contribute to.



### Power Modules for Automotive

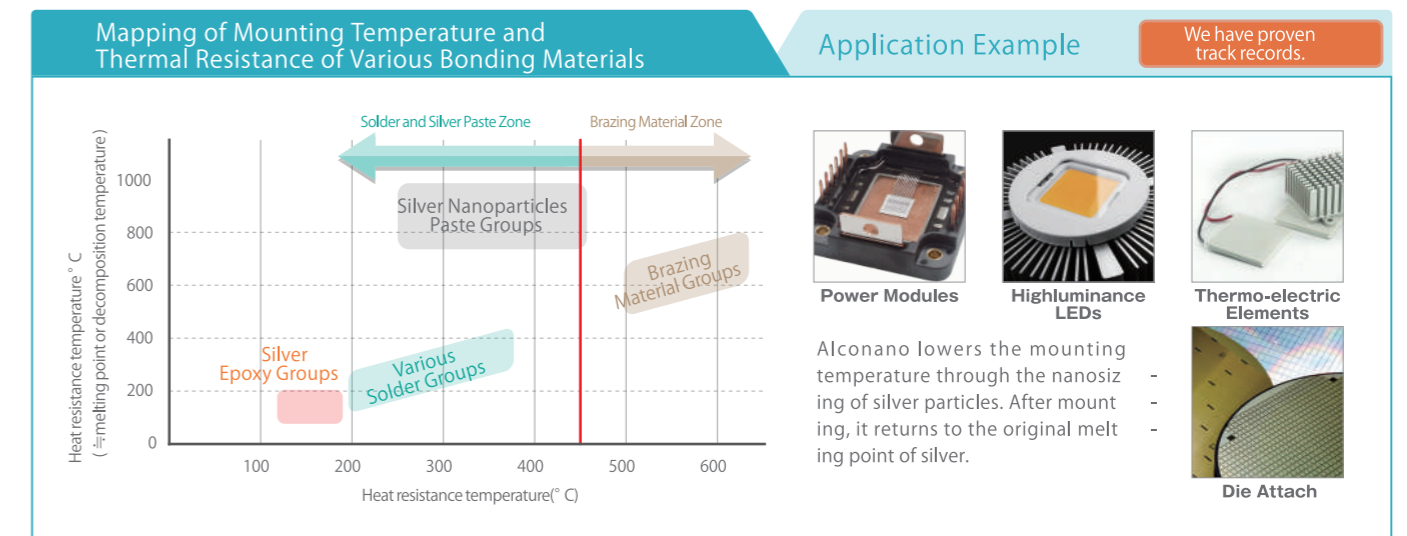
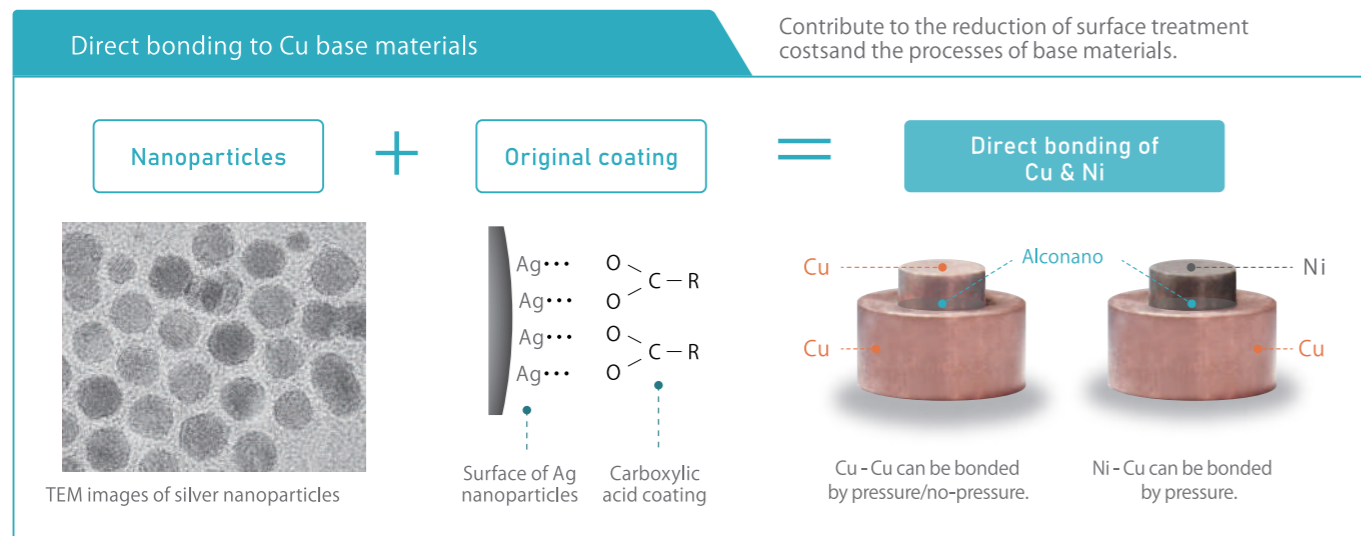
Alconano can contribute to the air-cooling of a vehicle's power module which generates heat through large currents, and are limited installation-wise.



## Alconano® Features Features of Alconano Nano-Silver Paste

❑ To directly bond to Cu / Ni through our original coating design


❑ Achieving both low-temperature bonding and high heat resistance, which are not possible with other bonding materials



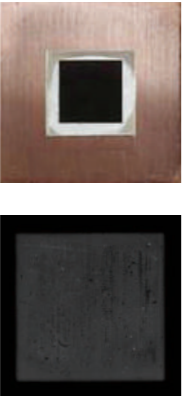
## Example in Use

### Example of bonding by pressing chip


SiC chip  
5 x 5mm



Si chip  
10 x 10mm

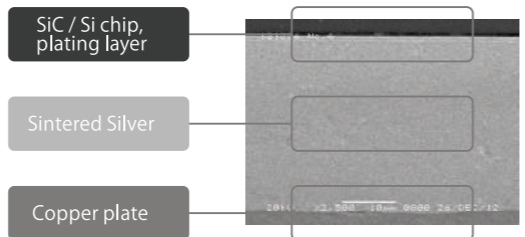


Si chip  
15 x 15mm



Good bonding is possible even with a size of 15 x 15 mm  
Alconano can bond directly to unplated Cu plates, such as Au through voidless soldering.

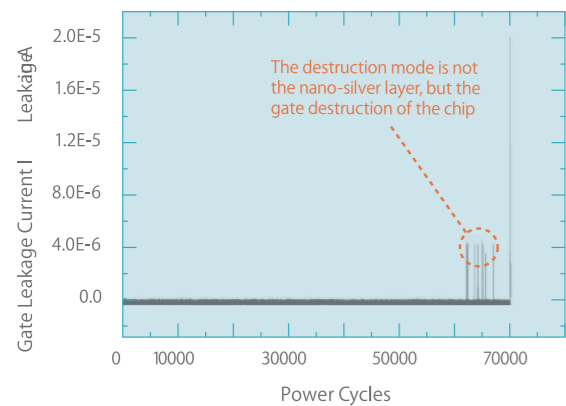
※ Bonding to a Cu plate of 30 x 30mm / t=2mm at 300°C under pressure of 10 Mpa for 5 minutes



SEM image of bonding cross section

※SAT images are enlarged for easy viewing.

### Example of reliability in the module by ANP-1



Confirming reliability by a power cycle (evaluation under cooperation with: Fraunhofer)

- Load Current: 96A
- Cycle Time: 9 sec. (heat for 3 sec.+ cool for 6 sec.)
- Cooling Temperature: 40°C Temperature Rise :120k Gate Voltage: 15V

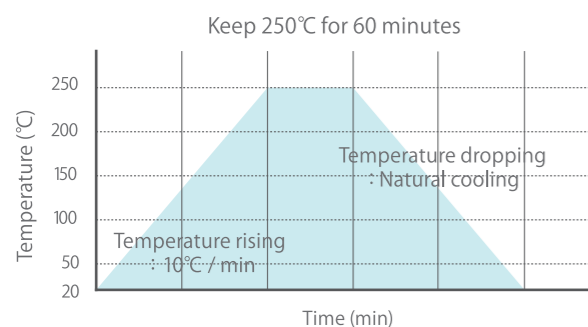
#### State of the test module



Directly bond the IGBT with die size of 9.73 x 10.23mm to DBC substrate without plating. Confirm reliability of 60,000 cycles or more through a power cycle test

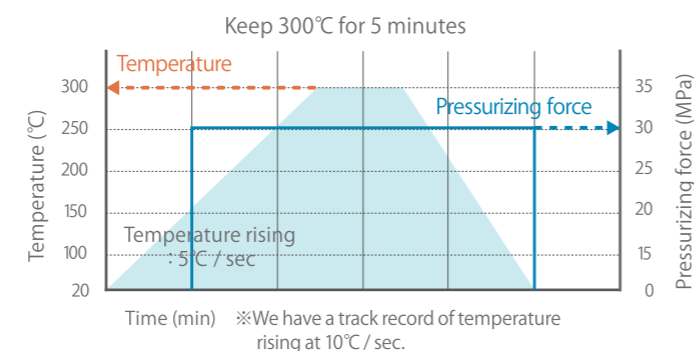
### Example of no-pressure bonding condition

ANP-1



### Example of pressure bonding condition

ANP-8



※Appropriate bonding conditions depend on the sample. Please contact the person in charge for detailed conditions.

## Product List

### Alconano Ag Paste

ANP-1

### Alconano® Nano-Silver Paste

Due to the coating design of nanoparticles, it is possible to directly bond to Cu at low temperatures and without the plating treatment of Au, etc. After bonding, it has excellent strength and high heat resistance. It is possible to use with or without pressure.



RoHS Compliant

ANP-8

### Alconano® Nano-Silver Paste

Achieved cost reduction by changing the filler from silver to micron Cu, all the while keeping the bonding reliability of ANP-1. ANP-4 is only compatible with pressure-bonding.



Contains copper Specilized for pressure

RoHS Compliant

## Table of Features

	ANP-1	ANP-8	Remark
Target Bonding Object	Die, LED, Thermo-electric Element, etc.	Die, LED, Thermo-electric Element, etc.	The optimum conditions are different according to the shape, material and so on of the work. Please contact the person in charge for more details.
Bonding Area	No-pressure: 5mm or less Pressure: 15mm or more	No-pressure: Incompatible Pressure: 15mm or more	
Surface Treatment	Au, Ag, Pt, Cu, Ni *	Au, Ag, Pt, Cu, Ni *	※For bonding Ni, pressure bonding at a temperature of 350°C or higher is recommended.
Paste Viscosity	50~200Pa·s	50~200Pa·s	It is possible to adjust other than the preceding value.
Metal Content Ratio	75~90wt%	75~90wt%	It is possible to adjust other than the preceding value.
Storage Condition	5~15°C	5~15°C	Do not freeze
Recommended Bonding Condition	No-pressure: Keep 250°C for 60 minutes Temperature rising speed: 10°C/min Pressure: Keep 300°C/10MPa for 5 minutes	No-pressure: Incompatible Pressure: Keep 300°C /30MPa for 5 minutes	In case of Cu bonding, N2 atmosphere recommended
Recommended Bonding Layer Thickness	>20μm	>20μm	Please contact the person in charge for more details.

## Table of features of the bonding layer

	ANP-1	ANP-8	Remark
Bonding strength	Over 40MPa	Over 40MPa	When pressure-baking with test piece of 5φt=2mm 10φt=5mm
Thermal Conductivity	330W/m·K	350W/m·K	Measured with the pressure-sintering sample through the laser flash method
Melting Point	About 960°C	About 770°C	Measurement with TG-DTA
Reliability	Achieved 45,000 cycles in power cycle test	Achieved 60,000 cycles in power cycle test	Minimum Temperature:40°C, Maximum Temperature:170°C, Temperature Difference:130°C, Cooling Time:60 sec. (heat for 30 sec. + cool for 30 sec.) Load Current:95A

※The above feature values are of those