

Application of Arctic Silver 5 Thermal Compound and Indium Shims for Qorvo CP-style Packaged Components

Introduction

Qorvo provides high power GaN amplifiers and other components in our proprietary CP packages using pure copper bases for improved thermal conductivity. This applications note provides some guidelines for obtaining the best thermal performance from these components, using either Arctic Silver 5 thermal compound or indium interface shims.

Caution: Never turn on a component in a CP package without the amplifier being properly mounted to a heatsink. Damage to the device may result.

Arctic Silver 5 Thermal Compound

Note: Arctic Silver 5 thermal compound should be kept away from electrical traces, pins, and leads. Arctic Silver 5 is slightly capacitive and could cause problems if it bridged two close-proximity electrical paths.

Only new thermal compound should be applied between the heatsink and the component base.

Never use any petroleum-based cleaners on the surface of the component or heatsink.

The base of the component and the heatsink should be cleaned with high-purity isopropyl alcohol and a lint free cloth. Important: keep the surface free of foreign materials and do not touch the surface after it has been cleaned.

If the component and heat sink are new, cleaning is not required, but is highly recommended. If any existing thermal compound is on the component and/or heatsink (due to rework of the EVB or assembly), the surface must be cleaned prior to applying the new thermal compound.

Qorvo recommends the following sequence for applying thermal compound:

1. Squeeze enough thermal compound onto the center of the mounting area of the heatsink to create a small mound. (Do not smooth or apply the compound with a bare finger as this will contaminate the surface. A small plastic tool with a small, flat edge, may be used to smooth out the compound.)
2. Alternately, a controlled volume of the compound may be dispensed onto the heat sink in the center of the mounting area.
3. During assembly process development for the specific application, the component should then be installed into the assembly and the mounting screws torqued to the proper value.
4. Remove the screws and component from the PCB assembly.
5. Inspect the mounting area to determine the thermal compound coverage obtained. The coverage should appear, roughly, as in Figure 1. The correct dispensed volume should be noted and used for future assemblies.

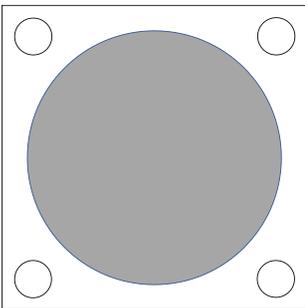


Figure 1. Post-Installation Surface Area of Arctic Silver 5 Thermal Compound

The package base and the mounting surface of the heatsink require a good surface finish and flatness. The total layer thickness of thermal compound should not be more than 0.001"-0.002" to fill the resultant gaps. A thicker amount of thermal compound can actually provide poorer thermal performance.

Indium Shim

Shims made from indium or indium alloy material may be used as thermal interface material for mounting CP-packaged components. Thin (0.002"-0.004") indium or indium alloy foil shims may be used. Qorvo recommends the HeatSpring® material from Indium Corporation as it conforms to surface disparities and provides a better interface between the component base and the heatsink, resulting in reduced thermal resistance and enhanced conductivity.

Clean the heat sink and component base as described in the section for Arctic Silver 5 thermal compound.

Cut the indium shim material by whatever means are convenient (razor blade, pre-purchased cut pieces, etc.), using the outline of the package base as a guideline (see Figure 2, below). The shim can be cut a few mils undersize to allow for tolerance in the placement, but the shim must cover the full area of the base, especially under the 4 mounting screws. Cutting the shim too small (covering just the center area of the component base or leaving the corners unsupported) may result in deformation of the copper component base when the mounting screws are tightened, causing poor thermal conductivity due to bowing of the base, and possible attachment issues with the various components inside the package.

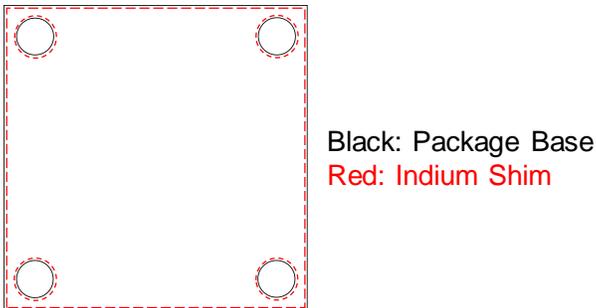


Figure 2. Indium shim outline guideline

Attaching the Component to the Heatsink

Inspect to make sure no foreign contaminants are present on either the bottom of the component or the top of the heat sink. Be sure to lower the component straight down onto the heatsink. If using thermal compound, once the component is properly inserted, very gently twist it slightly either clockwise/counterclockwise or move it linearly back and forth one time each if possible, depending on the amount of clearance available between the component and the PCB. This step is not needed when using an indium shim.

The following is for information only. There are many variables in a second level assembly that Qorvo does not control, so Qorvo does not recommend an absolute torque value. Due diligence should be performed by the end user on determining an acceptable torque value for their application.

Use screws to attach the component to the heat sink. A suggested final torque value is 16 in-oz. for a 0-80 screw. Start with screws finger tight, then torque to 8 in-oz., then torque to final value of 16 in-oz. The base of the component is pure copper and can be deformed and bowed by applying too much torque to the mounting screws. Use the following tightening pattern:

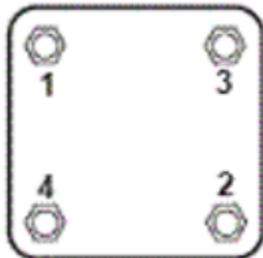


Figure 3 Torque Pattern for Attaching CP Package to a Heatsink

Apply no-flux solder to each pin of the component. The component leads should be manually soldered, with the package lead temperature not to exceed 260 deg C for a maximum of 10 s/lead. The component should not be subjected to conventional reflow processes. The use of no-clean, no-flux solder to avoid washing after soldering is highly recommended.

Additional Information

For additional information on, please contact Qorvo for general guidelines.

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

Web: www.qorvo.com
Tel: +1-(833)-641-3811
Email: customer.support@qorvo.com

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