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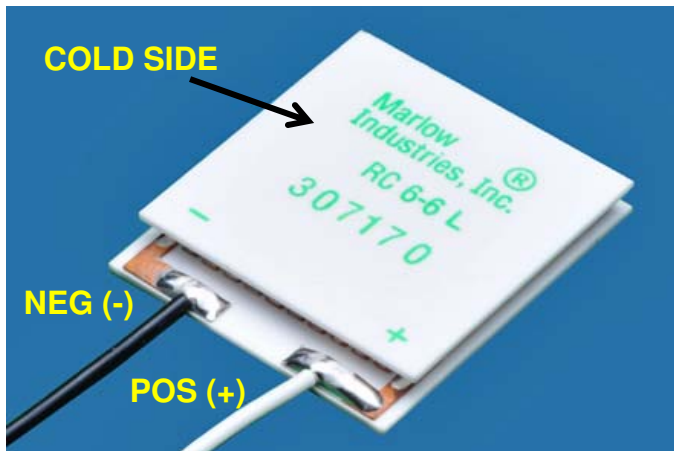


Thermoelectric Cooler Installation Guide

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An Overview of the Methods for Mounting Your Thermoelectric Cooler



Thermoelectric coolers (TECs) are mounted using one of three methods: adhesive bonding, compression using thermal grease or solder.

In general, for a TEC with a ceramic base of 19 mm or less, you can solder or adhesive bond without fear of failure due to thermal stresses. If the TEC base is larger than 19 mm, we recommend the compression method because thermal grease is not rigid and does not transfer thermal stresses.

A thin layer of copper metallization on the hot and/or cold ceramic allows soldering as a means of attachment. Keep in mind that a TEC without metallization cannot be mounted using solder. Remember also that adhesives and greases are prone to outgassing, so they are not as appropriate for use in a vacuum package.

The following methods are recommendations only, it is the customer responsibility to verify in their application.

Preparing Surfaces

Surface preparation is important when using any of the assembly methods. No matter which method is used, the mounting surface should be flat to less than .003-inch over the TEC mounting area. In addition, the surface should be clean and free from oil, nicks and burrs. When multiple TECs are placed in parallel, thermally between common plates, the TEC thicknesses should vary no more than .05 mm (.002-inch).

Mounting with Adhesive Bonding

When to Use: When you want to permanently attach the TEC to your heat sink; When mounting with solder is not an option; When the TECs need to be lapped to the same height after mounting; When moderate thermal

conductivity is required.

Step One: Because of the short amount of time needed for epoxy to set up, be certain to have your TECs cleaned and ready to mount before mixing epoxy. Clean and prepare mounting surfaces on both the TEC and heat sink using IPA, acetone or a general-use solvent.

NOTE: It is recommended that acetone and cotton swabs be available so that any excess or spilled epoxy (uncured) may be quickly removed.

Step Two: Use commercially available Thermally Conductive Epoxy. Follow the instructions on the package carefully. Follow all Safety Precautions.

Step Three: Coat the ceramic of the TEC with approximately a .05 mm (.002-inch) thick layer of epoxy.

Step Four: Place the TEC on the heat sink and gently rotate the TEC back and forth, squeezing out the excess epoxy.

Step Five: Using a clamp or weight, apply light pressure, and cure per manufacturer recommendation.

Mounting with the Compression Method

When to Use: When a permanent bond is not desired; When multiple TECs are used; When your TEC is larger than 19 mm.

Step One: Prepare heat sink and cold sink surfaces by machining the module area to within +/- 0.02 mm (.001 inch).

Step Two: Locate bolt holes in your assembly such that they are at opposite sides of the cooler between from 3.2 to 12.7 mm (.13 to .50 in.) the sides of the thermoelectric. The bolt holes should be in the same plane line as the heat sink fins to minimize any bowing that might occur.

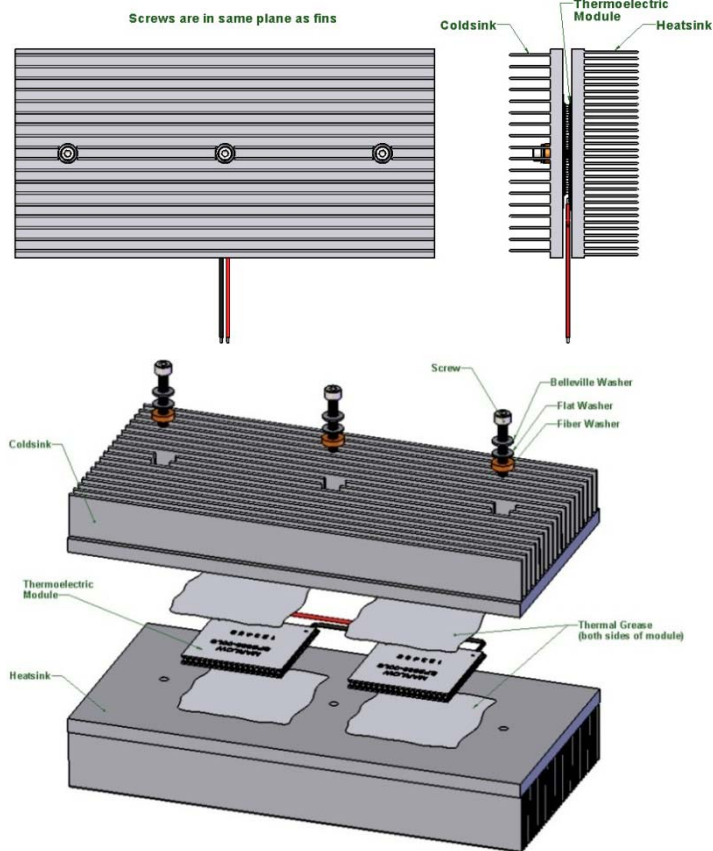
Step Three: The recommended hardware that should be used are: M3 or M4 (#4-40 or #6-32) stainless steel screw, Bellville or Split Lock type washers, as well as a Fiber insulated washer to insulate the screw head from the heat sink.

Step Four: Clean and prepare mounting surfaces with either methanol, acetone or general use solvents. Remove all burrs.

Step Five: Apply a thin 0.05 mm (0.002 inch) layer of Thermal grease to the hot side of the TEC's. Place the TEC on the heat sink and rotate the TEC's back and forth, squeezing out the excess thermal grease until resistance is felt.

Step Six: Repeat step 5, but for the cold side and rotate cold plate back and forth, squeezing out the excess thermal grease.

Step Seven: In a two module system torque the middle screw first. Be careful to apply torque in small increments, alternating between screws. In general, apply 1034 kPa (150 psi) force to the TEC area.



NOTE: Graphite pads may also be used as a thermal interface and require a higher clamping pressure depending on system set up. Please check thermal interface manufacturer instructions.

Mounting with Solder

When to Use: When you need minimal outgassing; When the TEC is smaller than 19 mm; When you need a high-strength junction; when high thermal conductivity is required.

IMPORTANT: The device to which the TEC is being soldered should be placed on a heated surface. This will allow the device to become hot enough to reflow the solder. The device may be placed on a hot plate set at 100°C to help heat it to the solder melting point.

Step One: Clean the surfaces to be soldered with methanol, acetone or a general use solvent, removing oils and residues which would prevent soldering.

Step Two: With a soldering iron and a new tip, pre-tin the bottom of the TEC (the side with lead wires) using Solder In52/Sn48 (117°C) and General Purpose Hallide Free Flux with an activity of ORHO or less. Use small amounts. You can heat the soldering iron up to a maximum of 150°C.

CAUTION: Do not mix solders. Use a separate soldering iron (or a new tip) for each solder.

Step Three: With soldering iron, pre-tin the header or heat sink with the same solder and flux as used in pre-tinning the TEC. Use small amounts.

Step Four: To minimize flux residue, clean both the header and TEC. Rinse them first in hot water, brushing away any excess flux residue. Finally, wash with IPA and use forced air to blow dry.

Step Five: Prior to mounting the TEC to the header, add a small amount of Flux as identified in Step 2 to the mounting site on the header.

Step Six: Hold TEC with tweezers and align on header. While doing this, maintain a steady, downward pressure.

Step Seven: While holding the TEC in place, put the soldering iron to the header near the solder seam. When the solder junction flows, remove the soldering iron. The downward pressure on the TEC will expel excess solder.

REMEMBER: If the solder which holds the TEC together flows at 138°C, and you are using the 117°C solder do not leave the soldering iron on the header surface too long, or you will melt the TEC solder as well.

Step Eight: Continue holding the TEC in place until the solder solidifies.

Step Nine: Check along all four edges of the TEC, looking for voids, cracks or bubbles. A smooth seam insures that there will be proper thermal conduction.

Connecting Lead Wire to Header

Step One: Trim the excess wire from the TEC. Wrap the lead wires 3/4 of a turn around the connector posts on the header.

Step Two: Using solder and a Hallide Free Flux, solder the lead wires to the wire posts. You should be able to see outlines of the wires, but they should be well covered. Wick off any excess solder with the soldering iron.

Final Cleaning and Inspection

Step One: Rinse both the header and TEC in hot water, brushing away any excess flux residue around the pins. Wash with hot water and dry with forced air. To insure complete removal of moisture, dry the entire assembly in an oven for 30 minutes at 60°C. If an oven is not available, forced-air should be adequate.

Step Three: Check the solder joints, looking for cracks or bubbles.

Preventing Problems

1. Do not use excessive amounts of solder. This can short the power leads and/or inhibit a good thermal interface.
2. Use the proper solder and flux activity.
3. Be sure to clean the TEC thoroughly to prevent outgassing.
4. Do not overheat the TEC with the soldering iron. Because of the narrow temperature differential between the mounting solder (117°C) and the solder used in the TEC (138°C), care must be taken not to overheat the TEC and reflow the solder.
5. During soldering, be sure the surface on which the soldering is being done is composed of a low thermal conductivity material. This will prevent the solder iron heat from being drawn away, which can cause difficulties with reflowing the solder.
6. When pre-tinning a large area of the TEC, pre-tin in small sections or buy the coolers pretinned by II-VI Marlow.
7. If a TEC is being soldered to a large header, it may require that the header be placed on a 100°C hot plate. This will minimize heat conduction away from the solder joint.

For further information or assistance, contact:

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