

Flackster Registered: 3 years ago  
**Attaching heat sinks - glue?** Posts: 99  
September 06, 2012 02:32AM

Hi,  
  
I'm putting my Pololu Stepper Drivers to my RAMPS electronics. My kit came with double sided sticky pads to attach the heatsink onto the chips. But it doesn't stick very well and I'm looking for an alternative. Is there some 'heat sink' glue or similar that people use??  
  
Thanks  
  
Pete

DeuxVis Admin Registered: 3 years ago  
**Re: Attaching heat sinks - glue?** Posts: 1,816  
September 06, 2012 07:00AM

I used this with success, you only need to put a really tiny pinhead sized droplet of it, and let dry a few hours.  
  
[\[export.farnell.com\]](http://export.farnell.com)  
  
The only drawback is that it's difficult to mix only the little quantity needed for a few heatsinks - you might waste some.

Most of my technical comments should be correct, but is THIS one ?  
Anyway, as a rule of thumb, always double check what people write.

NewPerfection Admin Registered: 5 years ago  
**Re: Attaching heat sinks - glue?** Posts: 1,425  
September 06, 2012 11:50AM

I've used superglue, it works quite well. It may even transfer heat better than the foam stickies since the interface is so thin. You could also mix up some epoxy with heatsink compound, about a 50-50 ratio.

Cameron

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pmarcus Registered: 2 years ago  
**Re: Attaching heat sinks - glue?** Posts: 15  
September 06, 2012 01:12PM

almost any glue, as long as it is thin should be okay. Remember that the heat you are able to dump through the top of an epoxy chip is pretty small. The added thermal resistance of a thin layer of almost any glue is going to be pretty minimal compared to the epoxy. This isn't like a CPU where you are dumping 100W. This is on the order of single watts.

xiando Registered: 2 years ago  
**Re: Attaching heat sinks - glue?** Posts: 477  
September 06, 2012 01:27PM

If your board isn't mounted so the plane of the board is vertically oriented, just use thermal compound. By itself it should provide a modicum of adhesion for such tiny heat sinks. The benefit is that it DOES have a decent thermal transfer coefficient, unlike many traditional "adhesives".

Traumflug Registered: 4 years ago  
**Re: Attaching heat sinks - glue?** Posts: 6,128  
September 07, 2012 04:22AM

When using superglue, the heatsinks fell off here after a few days. Standard superglue is rated to about 70 °C, A4983/A4988's thermal protection kicks in at 165 °C.

What I now use is screw locking glue ("Loctite"). Rated for 250 °C, hardens within a minute and even allows to remove the heatsink with moderate force, if needed. The only drawback is, it doesn't harden at room temperature, because the glueing surface is so small. Heating is very simple, though, just attach a motor and let it do a few movements.

[Generation 7 Electronics](#)  
[Teacup Firmware](#)

[Electrochemical Machining](#)  
[PCB Milling](#)

[RepRap DIY](#)

[Polygonhell](#)

**Re: Attaching heat sinks - glue?**  
September 07, 2012 09:38AM

Registered: 2 years ago  
Posts: 927

Since the color designates the holding strength, what colored loctite are you using?

[Annirak](#)

**Re: Attaching heat sinks - glue?**  
September 07, 2012 04:02PM

Registered: 5 years ago  
Posts: 400

NewPerfection Wrote:

- 
- > I've used superglue, it works quite well. It may
  - > even transfer heat better than the foam stickies
  - > since the interface is so thin. You could also
  - > mix up some epoxy with heatsink compound, about a
  - > 50-50 ratio.

You're doing it wrong ;-)

[[www.arcticsilver.com](http://www.arcticsilver.com)]

[[www.arcticsilver.com](http://www.arcticsilver.com)]

Edited 1 time(s). Last edit at 09/07/2012 04:17PM by Annirak.

[NewPerfection](#)

**Re: Attaching heat sinks - glue?**  
September 07, 2012 07:29PM

**Admin**

Registered: 5 years ago  
Posts: 1,425

Annirak Wrote:

- 
- > You're doing it wrong ;-)
  - > [[www.arcticsilver.com](http://www.arcticsilver.com)]
  - > adhesive.htm
  - > [[www.arcticsilver.com](http://www.arcticsilver.com)]
  - > \_adhesive.htm

Oh, I know that stuff exists. Most people don't have thermal adhesive, but more likely have both epoxy and thermal compound. I'm a cheapskate 😊

Cameron

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[Traumflug](#)

**Re: Attaching heat sinks - glue?**  
September 08, 2012 06:07AM

Registered: 4 years ago  
Posts: 6,128

Quote

Since the color designates the holding strength, what colored loctite are you using?

The medium strength.

And don't forget to press the heatsink on until it stops swimming. Getting the glue layer as thin as possible is important.

[Generation 7 Electronics](#)

[Electrochemical Machining](#)

[RepRap DIY](#)

[Teacup Firmware](#)

[PCB Milling](#)

[Annirak](#)

Registered: 5 years ago

**Re: Attaching heat sinks - glue?**

Posts: 400

September 10, 2012 09:04AM

NewPerfection Wrote:

>  
>  
> Oh, I know that stuff exists. Most people don't  
> have thermal adhesive, but more likely have both  
> epoxy and thermal compound. I'm a cheapskate 😊

That's fair, but the stuff isn't exactly expensive: about \$13.

My criterion for this is that if enough thermal adhesive to mount all your stepper drivers with heatsinks costs less than replacing one, it's worthwhile. After all, what happens if your epoxy+thermal compound fails?

[Lodorenos](#)

Registered: 2 years ago

**Re: Attaching heat sinks - glue?**

Posts: 83

September 11, 2012 07:51AM

I bought a 60g tube of thermal adhesive from ebay for \$2, it works wonderfully.

Charles S.

Software Engineer

Prusa Mendel I2, RAMPS 1.4, Marlin 1.0 R2, Pronterface, Slic3r

[fahraynk](#)

Registered: 1 year ago

**Re: Attaching heat sinks - glue?**

Posts: 41

November 28, 2012 11:22AM

so... can I just mix thermal paste with crazy glue for a vertical mount or will it fall off ? and its half / half ?

[sdim](#)

Registered: 1 year ago

**Re: Attaching heat sinks - glue?**

Posts: 4

November 29, 2012 11:06AM

Thermal Glue is the best option.

I used Arctic Cooling G-1. [[www.arctic.ac](http://www.arctic.ac)]

It needs some time for the procedure but it worth it. It costs 7.5€ in Greece and it has enough glue for dozens of heat sinks.

The adhesives are contained in six containers, (three pairs), so you can use the one pair and give the other two to friends.

[Traumflug](#)

Registered: 4 years ago

**Re: Attaching heat sinks - glue?**

Posts: 6,128

November 30, 2012 03:51AM

Quote

Thermal Glue is the best option.

... if you prefer marketing speech, yes. Anaerobic glue ("Loctite") works just as fine.

Generation 7 Electronics

Electrochemical Machining

RepRap DIY

Teacup Firmware

PCB Milling

willer

**Re: Attaching heat sinks - glue?**

January 20, 2013 10:05PM

I been using superglue with heatsink long time ago, I would like to say it depends on how well you glue it, If you can press it well and make sure no dust in between and the surface is flat. you can get a good heat transfer.

I had tested to measure a 10 watt led ([http://ac-rc.com/images/original\\_size/LED/SMD\\_10W\\_20000K.jpg](http://ac-rc.com/images/original_size/LED/SMD_10W_20000K.jpg)) glued to aluminium plate.

the temperature difference between LED's aluminum base and aluminium plate is small/almost same value. The temperature is measured via Pro'sKit multimeters.

james glanville

**Re: Attaching heat sinks - glue?**

January 21, 2013 06:09AM

Registered: 6 years ago

Posts: 332

+1 for superglue here, if only because I always have some around, whereas heatsink glue I lose or it lives in a long lost esoteric-glue-drawer.

Annirak

**Re: Attaching heat sinks - glue?**

January 22, 2013 12:25AM

Registered: 5 years ago

Posts: 400

Traumflug Wrote:

> ... if you prefer marketing speech, yes. Anaerobic  
> glue ("Loctite") works just as fine.

I suppose that depends on what you mean by "just as fine."

Loctite 382 has a thermal conductivity of 0.1W/(mK).

Assuming a bond thickness of 0.05mm, and a bond area of 5x5mm (the area of the A4988) that gives a thermal resistance of 20 Kelvin/Watt.

Loctite 3875 thermal adhesive has a thermal conductivity of 1.75W/(mK)

Assuming a bond thickness of 0.05mm, and a bond area of 5x5mm (the area of the A4988) that gives a thermal resistance of 1.143 Kelvin/Watt.

Arctic Silver Premium Silver Thermal Adhesive (ASTA) has a thermal conductivity of 7.5W/(mK).

Assuming the same 0.05mm bond thickness and 5x5mm bond area, that gives a thermal resistance of 0.2667 Kelvin/Watt

Assuming the A4988 is at a 45-degree point, with 2A max that means that each channel is at  $0.707 * 2A$ , giving  $1.414 * 2A = 2.828A$  total current. This is flowing through a 430mOhm high-side fet and a 430mOhm low-side fet, for a total power of 2.43W.

The junction temperature increase caused purely by the thermal interface material for each of these options is:

Loctite 382:  $2.43W * 20 K/W = 48.6 K$

Loctite 3875:  $2.43W * 1.143 K/W = 2.78 K$

ASTA:  $2.43W * 0.2667 K/W = 0.647 K$

Even if you don't believe Arctic Silver's marketing of 7.5W/mK, you should believe Loctite 3875 at 1.75W/mK.

While the rest of the cooling solution is important too, I hope you can see why "Anaerobic glue ("Loctite") works just as fine." is a bit misleading.

A second, important point is the thermal tolerance of the glue itself: Loctite 382 drops to 50% bond strength at 90C and 25% at 120C.

A more important point, however, is that heatsinking of exposed pad QFN packages should NEVER be done on top of the package. The thermal resistance of a QFN package ( $\theta_{jc}$ ) is in the range of 20-40 K/W, while the thermal resistance to the exposed pad is on the order of 2 K/W. The thermal resistance of a single 0.635mm via, filled with SnCuAg (SAC) solder, is:

$$1 / (((\pi * ((0.000635 \text{ m})^2)) / (.00157 \text{ m})) * (60 \text{ W})) / (\text{m kelvin})) = 20.6562309 \text{ kelvin} / \text{W}$$

A pattern of 9 of them, which is standard, works out to 2.295 kelvin / W

So, if you use loctite 3875 on the opposite side of the board to mount a heatsink, the thermal resistance to the heatsink is  $2 + 2.295 + 1.143 = 5.438 \text{ K/W}$ . If you heatsink the top-side of the A4988 with Loctite 382, which is what I believe you to be advocating, you have a thermal resistance to the heatsink of  $(20 \sim 40) + 20 = 40 \sim 60 \text{ K/W}$ .

Considering that the quoted thermal resistance of the A4988 on 4-layer PCB is 32 K/W, gluing a heatsink to the top of it with superglue might actually increase the thermal resistance.

Edited 2 time(s). Last edit at 01/22/2013 12:29AM by Annirak.

Annirak

Registered: 5 years ago

**Re: Attaching heat sinks - glue?**

Posts: 400

January 22, 2013 12:34AM

Oh, for reference, everything I've found on cyanoacrylates in general indicates that 0.1W/mK is normal for all "super glue" type adhesives.

royco

Registered: 3 years ago

**Re: Attaching heat sinks - glue?**

Posts: 155

January 27, 2013 09:11AM

Annirak Wrote:

- > A more important point, however, is that
- > heatsinking of exposed pad QFN packages should
- > NEVER be done on top of the package.

Exactly! (see attached)

3M thermal tape works but prefer thermal glue. Hardens in about 4 hours.