What chamber temperature does ABS actually need?

Asked 3D Content Team
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Abstract. Bambu Lab lists a 45 to 60 °C chamber for ABS and uses 60 °C for large, warp-prone parts, well below the 101 °C glass transition on Polymaker's data sheet.

Keywords: abs, chamber-heating, warping, enclosures

1 What chamber temperature does ABS actually need?

An enclosed chamber at 45 to 60 °C. That's the range on Bambu Lab's ABS data sheet, and its slicer guide saves 60 °C for large, dense parts prone to warping. Prusa asks only for an enclosure and a bed of at least 100 °C. Either way, the air stays under ABS's glass transition, 101 °C on Polymaker's data sheet.

1.1 Chamber temperatures and what they do to ABS

The rows run from the coldest air to the hottest reference point. The first is the only warp test: Ramian, Ramian and Dziob printed ABS (acrylonitrile butadiene styrene) blocks on an open Ultimaker 3 with a 90 °C bed, then measured the lift at each vertical edge with calipers. Everything else comes from the makers' guidance and data sheets.

Table 1. Chamber temperatures and what they do to ABS

Chamber air	Source and setup	What the source reports for ABS
About 20 to 30 °C, open printer	Ramian et al., no enclosure, 90 °C bed	Average corner lift of 0.86 mm on a 30 mm cube and 4.27 mm on a 120 mm bar, which bent into a "banana-shaped defect"
Enclosed, no set figure	Prusa knowledge base	ABS "requires printer enclosure" with "a higher ambient temperature" and a bed of at least 100 °C
Enclosed, no set figure	Polymaker PolyLite ABS data sheet	"Closure Chamber Needed (ambient temperature)", with a 90 to 100 °C bed
Enclosed, heater off	Bambu Studio default for ABS	Heater off for "other normal prints", because "the air filtration will get worse" when it runs
45 to 60 °C	Bambu ABS data sheet	The recommended chamber range, alongside an 80 to 100 °C bed
60 °C	Bambu Studio guide, for large or dense parts	"Reduced warping", better dimensional accuracy and on some models, stronger layer bonds
80 °C	Bambu ABS data sheet, 1.8 kg/m³	Differential scanning calorimetry (DSC) at 10 °C/min

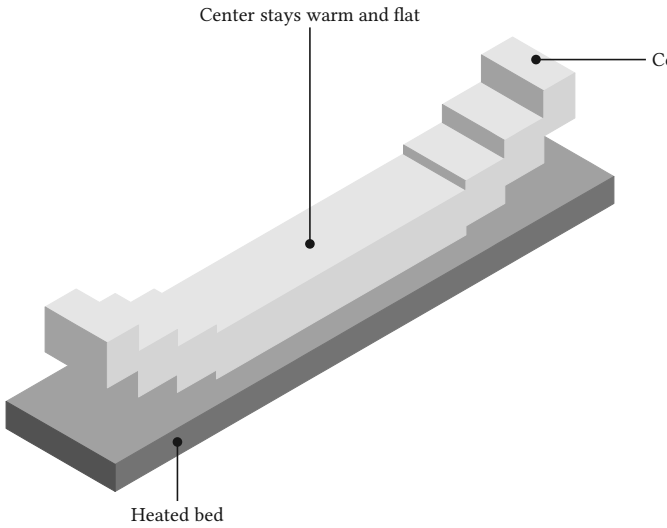


Figure 1. The middle of the part stays close to bed temperature while the ends cool first, so the corners peel up.

None of these sources measured lift in a heated chamber. The enclosed rows are the makers' advice, not test results.

1.2 Why warmer air stops the corners lifting

ABS warps on the way down, as it cools from its glass transition to the air around it. Ramian et al. put the damage "during the transition from glass transition temperature to chamber temperature." Bambu's guide blames the same gap. A high glass transition and a cold room leave "significant internal stress" in the part, which then shrinks and warps.

Ramian et al.'s thermal camera showed where that stress builds. On the open printer the bed sat near 90 °C, the middle of the part at 60 to 70 °C and the chamber walls at 20 to 30 °C. The edges ran cooler than the middle, and after two hours the top of a tall part was mostly below 50 °C. "This temperature gradient created stress and peeled off the cooler corners," the authors wrote.

Their fix was less airflow, "by closing it or by printing in a heated chamber." Warmer air shortens the drop from the glass transition, so less shrinkage piles up at the corners. Even 60 °C air sits 24 °C below the heat deflection figure on Bambu's sheet. Bambu's chamber heater setting runs from 40 to 60 °C. For an enclosure with no built-in heater, the wattage needed to hold that range depends on its size, panels and insulation; a chamber heater power calculator works it out.

More heat is not free. A hot chamber lowers how much Bambu's activated-carbon filter can soak up. Above 45 °C, Bambu also blocks loading low-temperature filaments such as polylactic acid (PLA) and PETG (glycol-modified PET), since they can soften and jam the extruder. Prusa adds that the heat inside an enclosure can deform the printer's own plastic parts, such as the fan shroud.

1.3 How to check it on your own print

- **Measure the air, not the bed.** Hang a thermometer in the chamber, clear of the bed and the nozzle, and read it mid-print. The bed warms the chamber only indirectly, so its setting tells you little about the air.
- **Preheat without a heater.** In a cold room, Bambu's advice for its X1C and P1S is to run the bed at its maximum for 15 minutes before you start. That warms the enclosed air.
- **Print a long test bar.** In the Ramian tests, length drove lift more than height. Print a bar as long as your real part, then measure the height at each corner and at the tallest point with calipers. The difference is your lift.
- **Cut the shrinkage load.** Dense parts shrink harder. On ABS, Bambu suggests infill at or below 50 percent, walls at 6 or fewer and glue on the plate.
- **Without an enclosure, add a draft shield.** That's Prusa's fallback: PrusaSlicer prints a thin wall around the part that keeps it "slightly warmer." If you ventilate the room, Prusa also warns against letting a draft blow across the printer.

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