

# Under the Surface: Our Expertise in BGA and Fine-Pitch Component Assembly



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BGA packages differ fundamentally from perimeter-leaded components. Solder balls are arranged in an array beneath the component body, making every joint invisible after placement. This means placement accuracy must be exceptional—the component must align perfectly with PCB pads before reflow, as any misalignment will cause shorts or opens. Additionally, BGA packages require precise reflow profiling to ensure all balls melt simultaneously and collapse uniformly onto their corresponding pads.

### High-Precision Placement Equipment

Our SMT lines are equipped with advanced placement machines capable of BGA placement with  $\pm 15$  micron accuracy. These systems use upward-looking cameras to locate the component's solder ball array, downward-looking cameras to identify PCB fiducials, and sophisticated algorithms to calculate the precise position correction for each placement. Prior to each BGA placement, the machine verifies that no balls are missing or damaged—a common defect that would otherwise go undetected until X-ray inspection after reflow.

### Thermal Management for BGA Assembly

BGAs are particularly sensitive to thermal uniformity. The mass of the component body can create temperature differences between the center and edges of the ball array. We manage this through extended soak zones that equalize component temperature, controlled ramp rates that prevent differential expansion, minimized delta-T across the board surface through oven calibration, and nitrogen atmosphere for improved heat transfer. Our thermal profiles are validated using thermocouples placed beneath actual BGAs, not just on adjacent board surfaces.

### X-Ray Inspection: Seeing the Unseen

Because BGA joints are invisible after assembly, X-ray inspection is mandatory. Our 2D and 3D X-ray systems provide multiple views of every BGA joint, detecting voids (gas pockets within the solder), bridging (unintended connections between adjacent balls), missing balls (no solder connection present), insufficient solder (ball not fully collapsed), and head-in-pillow (ball and pad melted but not joined).

Acceptance criteria for voids are typically specified by clients or IPC standards—generally less than 25% of ball volume for most applications, with stricter limits for thermal or power BGAs.

### **Underfill for BGA Reliability**

For assemblies subject to mechanical shock, vibration, or thermal cycling, we offer underfill application. A liquid epoxy is dispensed along the edges of the BGA after reflow and inspection, drawn beneath the component by capillary action, then thermally cured. The underfill material bonds the component body to the PCB, distributing mechanical stress away from the fragile solder joints. Underfill dramatically improves BGA reliability in demanding environments such as automotive, industrial, and portable electronics.

### **Fine-Pitch QFN and LGA Assembly**

Beyond BGAs, we specialize in other hidden-lead packages. Quad Flat No-lead (QFN) components have exposed pads on their bottom surface, requiring careful solder paste volume control to avoid bridging while ensuring full pad coverage. Land Grid Array (LGA) packages, similar to BGAs but without balls, rely on solder paste alone for connection and require even tighter process control. Our experience across these package types ensures reliable assembly regardless of component style.

BGA and fine-pitch components are increasingly common in advanced electronics. Our specialized equipment, processes, and inspection capabilities ensure that these critical devices are assembled reliably, even when their connections remain hidden from view.

**Does your design use BGAs or other fine-pitch components? Contact us to learn how our advanced assembly capabilities can bring your complex designs to life with confidence.**

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