



## About EPE Corp.

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

EPE is a leading supplier of high-reliability Electronic Manufacturing Services. Our deep manufacturing and engineering expertise, strong financial position, and passionate dedication to quality and integrity are at the foundation of an established structure that supports the electronic manufacturing needs of customers in diverse industries – and a demanding marketplace

## GOAL

Understand and reduce or eliminate the incidence of voiding and pad lifting of LGA assemblies.

## APPROACH

Focus on an investigation of precisely what was happening during the assembly process to cause the issues. Intense examination of the behavior of solder as it reflows between two flat surfaces and making micro-adjustments to the speed and character of flow.

## RESULTS

- 98% void failure rate reduced to 5-10% with 0% lifting
- 4 month investigative process revealed a unique solution for LGA placements and established EPE Corp. as a 'go to' company for LGA's
- Turned a concerned customer into an EPE advocate that "recommends EPE to its customers"

## HIGH RELIABILITY EMS provider EPE Corp. Establishes Expertise in Land Grid Array Assembly and Wins Customer Certification

The land grid array (LGA) is a packaging technology with a square grid of flat contacts that are meant to interconnect with an opposing grid of contacts on a printed circuit board (PCB). Also referred to as a QFN "Quad Flat No Lead" or MLFP "Micro Lead Frame Plastic" package, LGA packaging is related to ball grid array (BGA) and pin grid array (PGA) packaging, but unlike pin grid arrays, land grid array packages are designed to either fit into a socket or be soldered down using surface mount technology. PGA packages cannot be soldered down using surface mount technology. Further, land grid array packages in non-socketed configurations use a flat contact which is soldered directly to the PCB, whereas BGA packages have balls as their contacts in between the IC and the PCBs.

The assembly of LGA packages using soldered surface mount technology is inherently challenging because the interface between the flat contacts and the PCB surface can trap air pockets, causing voids during processing. Such voids are exceptionally difficult to eliminate and to repair or rework the packages are both time consuming and carry significantly high costs.

EPE Corp. faced a daunting LGA assembly challenge for a major high performance analog integrated circuit manufacturer. Unacceptable voids during the assembly process were seen on nearly 100% of large production runs. With the clock ticking, cost run-ups mounting, and customer satisfaction waning, EPE brought its technical team together and created a single-minded focus on understanding and solving the problem. Not only has the problem been solved, but the resulting quality of product compelled the customer to declare EPE Corp. a "preferred assembly supplier".

## Void and Lift Challenges

EPE Corp. received a circuit card assembly order from a defense contractor for 10,000 units that involved placing 4 distinct LGA's per assembly, or 40,000 total placements. Each LGA had a unique solder stencil an initial placements resulted in voids that exceeded the IPC standard of 30%. In fact, EPE was experiencing some 98% fall-out due to voids and pad lifting was also evident at unacceptable levels. The matter was puzzling at best.

EPE determined to investigate and resolve the issue by assigning their technical experts to work directly with the LGA supplier and the end customer. Over a 16 week period, and with numerous communiques, consultations, designs of experiment and attenuating the assembly process, the combined teams discovered a phenomenon related to how solder flows between two opposing flat surfaces: The pads of the LGA itself and that of the PCB surface pads to which they attach.

That discovery revealed unique differences between soldering such interfaces and those of BGA's or PGA's. The solder flow had to be 'perfect' to create a low-void mechanical bond.

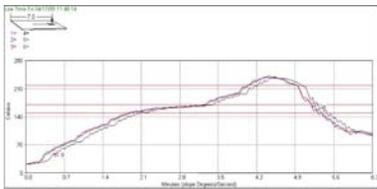
*"Collaboration between the LGA supplier, the end user, and EPE allowed us to solve this technically challenging problem". Rob Davies, Engineering Manager*

**Letter from Worldwide  
Manufacturing Q.A.  
Engineer and  $\mu$ Module  
Products Packaging  
Engineering Manager...**

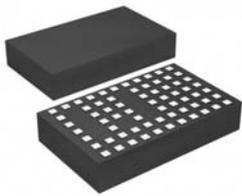
*"We are happy to inform you that EPE Corporation (Manchester, NH) is now a preferred assembly supplier and we will therefore recommend you to our customers.*

*We will also notify all our sales offices and distributors regarding our confidence in your capabilities."*

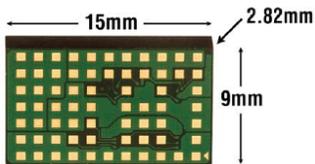
**High performance analog integrated circuit manufacturer (Customer)**



*Reflow Profile*



*Low VIN, 8A DC/DC  $\mu$ Module  
Regulator with Tracking, Margining,  
and Frequency Synchronization*



**Astounding Results**

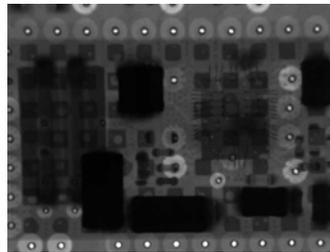
Using sophisticated reflow analysis equipment, EPE technicians were able to profile the characteristics of the solder, the solder wave, and the dynamics of how the solder behaved as it met the pad interface between LGA and PCB. Everything from the type of solder paste used; the speed of solder flow; solder temperature activation; time curves for heating/cooling the solder; and the orientation of the LGA components were examined and various combinations of these variants were attempted.

Gathering all of the empirical evidence produced over 4 months of experimentation, the team had a bellwether moment: Using a proprietary 'formula' that sets an exact combination of temperature, speed, orientation, and time sequencing, the LGA placements began to seat with near perfect results.

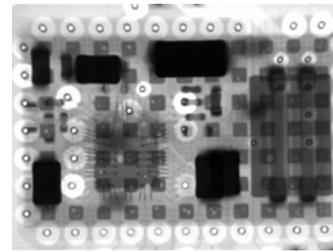
With subsequent approvals from the LGA supplier and the end-user, EPE began low rate initial production and the results were impressive. The 98% fall-out rate from voids was reduced to between 5-10% and rework was a minimal process. Pad lifting was virtually eliminated and the production schedule was able to ramp back up.

The customer then sent EPE Corp. a 'Preferred Assembly Supplier' letter, distinguishing the company as a 'go to' provider of LGA assemblies. The single-minded focus and man hours that EPE devoted to solving this important problem elevated EPE as a supplier and established them as uniquely suited to placing LGA devices in a marketplace where such devices will remain a burgeoning application.

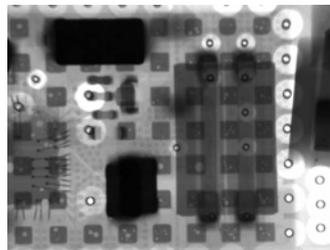
LGA's have a very small footprint; are typically used in RF applications, and often use lots of power concentrated in a small geography of the PCB surface. With the aspect of continuous miniaturization in electronic assemblies, RF/Microwave applications conducting ever higher frequencies, faster data rates and greater data densities, and with power control being the most critical feature of emerging electronic designs, EPE Corp. is now positioned to address the need for competent LGA assembly.



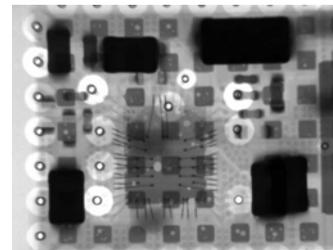
*Before*



*After*



*After*



*After*