

















Figure 12 % Failure QFN 2

## CONCLUSIONS AND RECOMMENDATIONS

A constant of approximately 0.0269 g/mm represented the ratio at which a molten SAC305 solder joints failed to hold a QFN on the bottom side of a PCB during reflow, as a function of component mass versus total perimeter of wetted surface. Applying a 20% failure buffer to this value produced an average failure ratio of 0.0215. The standard deviation associated with this value was very small indicating minimal variance and most likely well suited to applications that involve many different component types. Certainly for QFN 2 taking into account void perimeter resulted in a tighter grouping of the failures.

QFN components with a greater surface area demonstrated a higher level of variance for the percentage failure as a function of the component weight versus total wetted perimeter ratio. A recommendation would be to custom make added weights so they cover the entire surface of the part to be tested. This would result in less chance of not having the weight centered and it would provide less surface area to be affected by oven air turbulence. Monolithic weight would also mostly eliminate different amounts of glue sued to hold multiple weights to the parts being tested.

The range of components tested should be expanded. A wider range of components should be tested to verify whether or not it would be appropriate to the apply the ratio

determined from this experiment to various other components involved in the manufacturing process.

All work should be duplicated in batch and conveyORIZED ovens to see if there is a major difference due to oven type.

Reduce the number of runs for each test board. Board stress such as blistering and warping was observed on boards that had been tested more than three times. While boards were only tested a maximum of three times with no visible stress, internal stress may have occurred after the first run. Fewer runs for each board should be done to determine if this will have an effect on the consistency of results.

## REFERENCES

- 1) Phil Zarrow, "Soldering", Surface Mount Technology (SMT), August 2000.
- 2) Dr. Ning-Chen Lee, personal communication.
- 3) Y. Liu, D.A. Geiger and D. Shangquan, "Determination of Component "candidacy for Second Side Reflow with Lead-free Solder", ECTC, 2005.
- 4) Image J download - [rsbweb.nih.gov/ij/download.html](http://rsbweb.nih.gov/ij/download.html).