An Analysis on Process Parameters of Solder Jet Bonding to Increase the Shear Strength of Solder Joint in HGA

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This paper intends to improve the shear strength of lead-free solder joint produced by the solder jet bonding (SJB) process using Nd:YAG laser to melt the solder ball. Currently, SJB is one of the most important processes for head gimbal assembly (HGA) which is a component of the hard disk drive. SJB is used for connecting circuits on slider to circuit pads on suspension. In this process, shear strength of solder joint is a vital quality characteristic and it needs to be increased. The root cause analysis tools including Cause & Effect Diagram, Cause & Effect Matrix, and FMEA were employed to determine the potential key process input variables (KPIVs). These analysis yielded us eight potential KPIVs. Then, a single replicate of 2^{8-2} fractional factorial design was also performed to determine the significant factors which affect the shear strength of solder joint. The statistical analysis and regression model were utilized to obtain the optimal process parameters. This optimal process parameters could significantly increase the shear strength of solder joint from 150 gram-force to 289 gram-force.

Keywords:
Process Improvement, Solder Jet Ball Bonding (SJB), Nd:YAG Laser, Shear Strength, Design of Experiment.

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