CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

This chapter will discuss about background of study, problem statement and objective. Widely present in our daily life, liquid film flow can be define as motion of a fluid subjected to unbalanced forces or stresses. The motion continues as long as unbalanced forces are applied. For example, in the pouring of water from a pitcher the water velocity is very high over the lip, moderately high approaching the lip, and very low near the bottom of the pitcher. The unbalanced force is gravity, that is, the weight of the tilted water particles near the surface. The flow continues as long as water is available and the pitcher remains tilted. For example, blood circulation which allows the blood flow through entire body and rainy day and water drop and absorb into soil.

In industry of micro-packaging, there are various kinds of method have been used, such as flip-chip technology. It is the strongest interconnection method that use in this industry. Before this, there is another method which had been introduced that is wire bond packaging. Flip-chip technology is actually that use adhesive to stick the chip in board so that the chip is adhesive completely on the board. As s simple definition, it can be seen that the underfill flow is kind of flow in between narrow. It “combines together” between chip and substrate (George Riley, 2000) as shown in Figure 1.1
Another method that had been used other than the flip-chip technology in micro-packaging is wire bonding. Generally, wire bonding is a method used to connect a fine wire between an on-chip pad and a substrate pad. According to a definition provided by Smith (2001:23), wire bonding is long conductive wires are connected between a chip and a substrate (Kim, Y. B. and J. Sung, 2013) as shown in figure 1.2.

Figure 1.2: Wire Bonding Assembly
The short interconnection in the flip chip technology is more advantageous than the long wire connection for manufacturing thinner and smaller integrated circuit systems. It also possible to improve electrical performance (Kim, Y. B. and J. Sung, 2013). By using a flip chip interconnect process, the chips can be electrically connected in a more compact fashion, better than wire bond that needs some space for a lot of wire. It is because the flip-chip technology uses solder bump that need a little space for its gap height. When compared to a wire connection, the lower inductance of a bump connection will translate into reduce losses and lower power requirements.

![Diagram](image)

**Figure 1.3:** Wire connection vs. flip chip bump connection

In flip chip technology, analysis of underfill flow between chip and substrate are important to prevent the chip from breaking. In other words, the welded solder balls in the of packaged chip, underfill epoxy is filled into the gap between a chip and a substrate. It is because to prevent cracks on the solder bump and electrical failure resulting from thermal fatigue. However, a large difference in the thermal expansion coefficient (CTE) between the silicon chip and the organic substrate bring up significant thermal stresses on the interconnections during thermal cycling. Therefore, the underfill epoxy would relax the stresses produce by the CTE mismatch, might as well as reduces the impact and