A Study of Applying RFID for Heat Block Management in IC Packaging Factory

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ABSTRACT

In the integrated circuit (IC) packaging process, including operations of die sawing, die bonding, wire bonding, molding, plating, marking, trim/form, and inspection. Purposes of packaging include protecting ICs, making ICs easier to handle, and connecting ICs to the circuit outside. The wire bond stations are the bottleneck in the packaging and assemble process where the heat block is the key auxiliary parts in the stations. This research proposes a RFID-enabled Heat Block Management System (RHMS) to accurately control the progress of the IC packaging production line to meet the customer requirements. Our research analyzed all the flows of heat block management operations during before and after introducing RHMS. Hypothesis testing can verify significant difference between two sample sizes. Based on the statistics test of hypothesis, we compared the difference for before and after introducing RHMS. The results show that the RHMS can bring advantage for heat block management in wire bond stations. Moreover, it has clear improvement of saving counting and revising operation time. The contributions of this research are not only a case study but also a direction for applying RFID technology on IC packaging industry.

Keywords: Heat Block, IC packaging, Radio Frequency Identification (RFID)

1. INTRODUCTION

Under the competitive manufacturing circumstance of semiconductor industry, it is an important task for semiconductor packaging plants to reduce the production lead-time for providing a quickly multi-production. Taiwan’s semiconductor industry has played an important role in the world through many years rapid growth. The close interaction and cooperation among firms have become the characteristics of Taiwan’s semiconductor industry. How to keep advantages in the global competition is an important issue now. The purpose of wire bonding is to use a fine gold wire to connect the IC bond pad with the inner lead of substrate. Generally, meet the order delivery date is crucial to the performance of IC packaging factories. However, wire bond is a typical bottleneck process in this industry (Hsiao, 2006). The
function of heat block is to prevent vibration of lead frame. Moreover, the heat block is the key auxiliary parts in Wire bond station (Li, 2000) for revising machine. It is an important issue to management the heat block for Wire Bond station.

RFID is a generic technology concept that refers to the use of radio waves to identify objects (Auto-ID Center, 2002). Stockman had proposed to make use of radio waves that carry identification information (Stockman, 1948). Since the first on the Radio Frequency Identification (RFID) patents was made after, RFID related applications have continued to facilitate conduct. The Application of RFID technology has begun as early as World War II, the main purpose is to identify the enemy aircraft. This technology adopts a tiny microchip which is built in the RFID tag; it can record a series of information such as: item ID, manufacturing date and expiration date in the whole process. RFID technology holds the promise to automatically track items as they move through the supply chain (Christian and Matthias, 2005). RFID is a technology for applying in automatic data collection for real-time data collection. The benefits of RFID include: (1) identification does not depend on physical contact or direct line of sign observation by the reader; (2) much more data can be contained in the tag than with most ADC technologies (Grover, 2001).

For the purpose to decrease the absence of heat block to increase the Wire Bond stations performance of IC packaging factory, this paper proposes a RFID-enabled Heat block Management System (RHMS). After that, this study analyzed all the flows of heat block management operations while before and after introducing RHMS. Based on the statistics test of hypothesis, we compare the significance level while before and after introducing RHMS. The results show significant difference and clear efficiency for performance improvement. Through RHMS, it not only raises the counting efficiency but also reduces the revising operation time for production.

2. LITERATURE REVIEW

However, the semiconductor industry is mature today, it also push forward the orders increasing in the Wafer Probing, IC Packaging and Testing industries. In order to satisfy customer requirements, companies adopted multi-plant production type from single-plant production type and achieved the minimizing of the total cost by sharing the capacity resource. In the IC packaging process, including operations of die sawing, die bonding, wire bonding, molding, plating, marking, trim/form, and inspection. Purposes of packaging include protecting ICs, making ICs easier to handle, and connecting ICs to the circuit outside. The definition of production time to whole IC packaging factory is composed of three parts (see Fig.1). They are Setup time, Operation time, and Non-operation time (M.P. Grover, 2001.).

By the definition of production time, the “revising machine operation procedure” will directly affect the setup time and non-operation time, in addition, also affect the production time.

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