

# Neurala VIA for PCBA Inspection

## Overview

Printed Circuit Board Assemblies are complex items to manufacture: they consist of a board, solder applied using a mask, and various electrical components, including capacitors, resistors, transistors, batteries, LEDs, and more. PCBAs are critical pieces of almost every electronic device manufactured today, and estimates place the global PCBA market at \$79Bn by 2024.

A large manufacturer may have the ability to produce PCBAs in house. In this case, they may only produce a few different boards at high volume. But when products start to have a lot of variation, manufacturers will produce only a small number of each board. For companies that do not have this capability in house, but still design and sell electronics, they turn to a PCBA contract manufacturing house. Contract manufacturers may produce high volumes of a small number of parts, or low volumes of many parts, or a mix. They must often provide samples and initial prototypes with exceedingly small lot sizes (about 10 parts), and often do not complete a full QA (Quality Assurance) inspection before arriving at the customer.

Take a contract manufacturer that produces a mix of different PCBAs for various customers. They have in-house design capability and primarily use Surface Mount Technology to place components. They manufacture complete assemblies, from creating the bare board, to final test. This contract manufacturer also has quick turn prototyping services.

The company has a high mix of products, which are also produced in very high volumes.

## Current State

Contract manufacturers typically use x-ray inspection, functional testing, and AOI machines (Automated Optical Inspection). The level of testing done is dependent on the customer and their contract. The more testing that is done (e.g. up to functional testing), the more expensive the PCBA--but also the higher the quality. These AOI machines are specially programmed and require specific knowledge of the machine. The machines are also slow, require an operator, and take time to update.

## Neurala VIA Implementation

Neurala VIA can either replace or complement existing solutions. For example, if the company wanted to provide the level of testing of AOI machine inspection at a lesser cost, or for a small batch, they can train a Neurala model and implement Inspector to indicate good and bad PCBAs.

Depending on the level of defective parts available, a classification model could help indicate the type of failure. A few examples of the types of failure this approach could identify include solder traces not complete, component missing, or component in the wrong orientation.

## Adapting to Market Changes

Large contract manufacturers are facing unprecedented changes to their systems, leading to an increased focus on automation throughout their process in order to reduce the proximity of people working on the floor. With their current AOI machines and functional testers, they require a person put the PCBAs on the bed of the AOI machine to be analyzed. Then a person reads the outputs and determines what to do with the product after the result is given by the AOI machine. The contract manufacturer in question is now examining options to use conveyors to move the product around, and a controller to determine what to do with the product after quality is determined. AOI machines are not able to accept this type of automation, so they are examining options that don't require large capital expenditure.

### The Bottom Line

- **Ease of change:** Neurala's solution does not require an expert to set up, and only requires images of "acceptable" product to train a model to find defects. Get up and running faster, with less expertise. Most operators should be able to program and run a model.
- **Cost:** Unlike an AOI machine that can cost up to \$500,000, both the equipment needed and the software itself are significantly less expensive. The increase speed of set up, and the fact that skilled programmers aren't needed, will decrease overall cost of implementation as well.
- **Variability:** Neurala VIA provides the contract manufacturer with the ability to provide more inspection types to their customer.
- **ROI:** With only a slight increase in cost, the solution gives the contract manufacturer the ability to offer higher quality to the customer.