CYPRESS SEMICONDUCTOR CORPORATION
Internal Correspondence

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Author File #:	QIBO#109
Subject:	HP 101004 LAMINATION CHECK MANUFACTURING TEST STATION
Category:	TRACKPAD, TEST DEVELOPMENT
Distribution:	PZHO, MZFA, WEIQ, ARDN, RQB

1 INTRODUCTION

This memo documented the proposal for HP mouse module lamination manufacturing test setup at Lite-On. Lite-On will assemble our FPC board to the plastic shell, and they want us to provide the test method and test fixture to check the lamination on their production line.

2 DUT MODULE

Picture 1 shows the DUT at Lite-On, after assembled the 101004 FPC board to the plastic shell, Lite-On want to have a test station to check the lamination, for example air gap exists between the shell and FPC board. The requirements from Lite-On:

- The test is automatic, no manual operation needed except button clicks.
- The test shows PASS or FAIL, no personal judgement needed.
- A metal plate is used to detect signal level and air gap.
- The test development must be finished in 2 weeks.

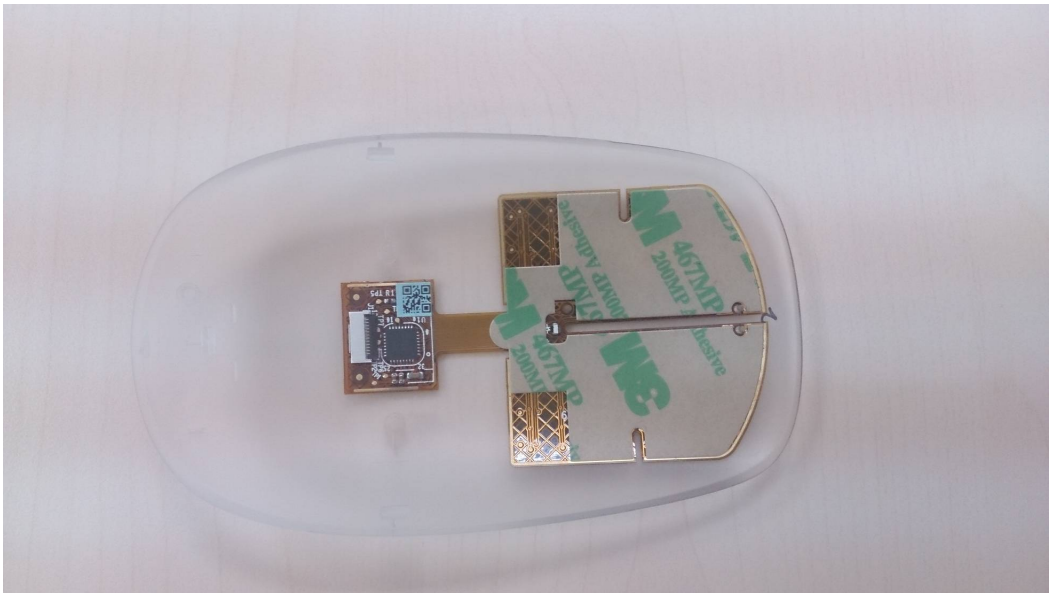


Figure 1: DUT, half assembled at Lite-On

3 TEST FIXTURE AND SOFTWARE DESIGN

3.1 Requirement analysis

Although we built some IQC test stations for customers, We haven't built any fixture for customer's manufacturing line test. And for lamination and air gap detection, the difficulties for this tester:

- The surface is not flat, it's not easy to cover a metal plate on the top of the mouse.
- 101004 use the MTG platform, not APA, so actually we don't have all points signal level, only X and Y axis values.
- The signal level is sensitive to the temperature, if temperature raise, the signal raise.

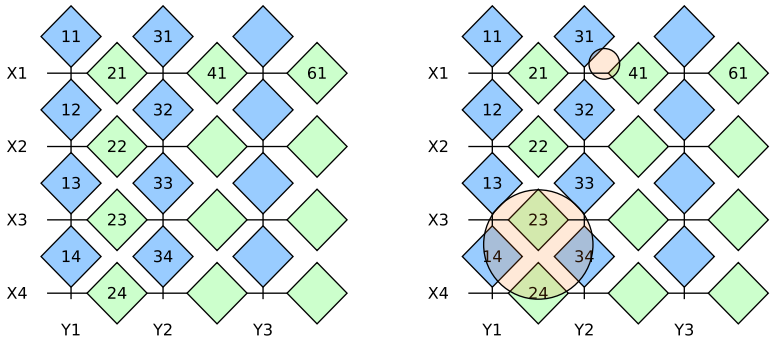
3.2 Test method

The signal level of MTG is summary of each sensor on 1 axis, for example, in Figure 2, Signal level of X1 = sensor21+sensor41+sensor61. So when we place whole metal plate on the surface, the SNR for each sensor actually is the sum of the signal divided by the noise, for example when we put one finger on the sensor X1Y1, we get the SNR level 5, but if we put whole plate on trackpad, the SNR of X1Y1 will become 5*8=40, So we cannot use the test condition "SNR>5" on the lamination check test.
There are 2 methods we defined:

- Capture signal data on each X and Y, set individual test limitation. Test steps as follow:
  - capture signal level without metal plate.
  - capture signal level with metal plate.
  - compare the difference, compare with the threshold on each X and Y.
- Capture signal data with metal finger on individual sensor by each. Test steps as follow:

- place metal finger on 1 sensor area.
- capture the signal level, calculate SNR, compare with the threshold.
- move to next sensor area, repeat.

Since the method 2 will take long test cycle time, we will try the method 1 first. But the difficult part for method 1 is, we need set a data distribution for each individual sensor, so we need capture data from samples first, and if the firmware can report the signal directly in test mode, it will eliminate the temperature effects.
The figure 2-b shows the 2 air gaps on the sensor area, the big one will affect the X3, X4, Y1 and Y2, the small one probably will not be detected.



(a) Sensor Pattern: No Air Gap (b) Sensor Pattern: With Air Gap

Figure 2: Sensor Pattern of MTG

3.3 Test fixture

According to the requirement, we design the test fixture structure, see Figure 3 and Figure 4.

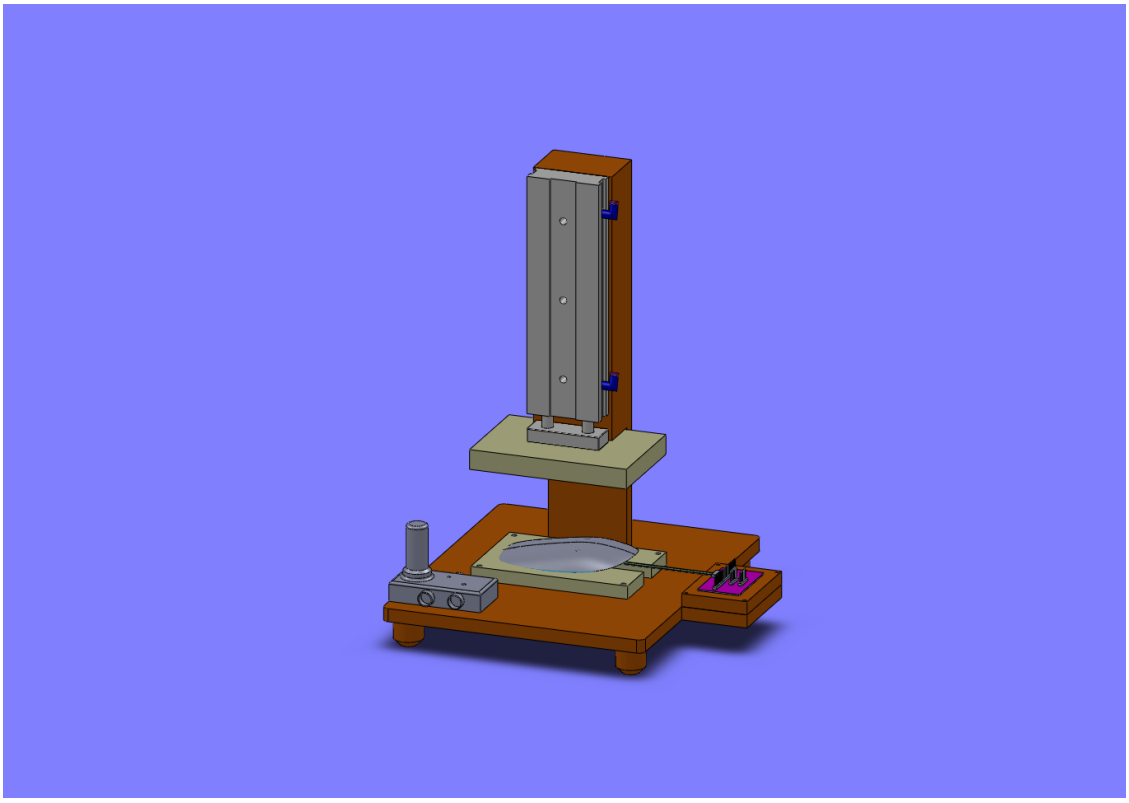


Figure 3: 3D view of fixture model

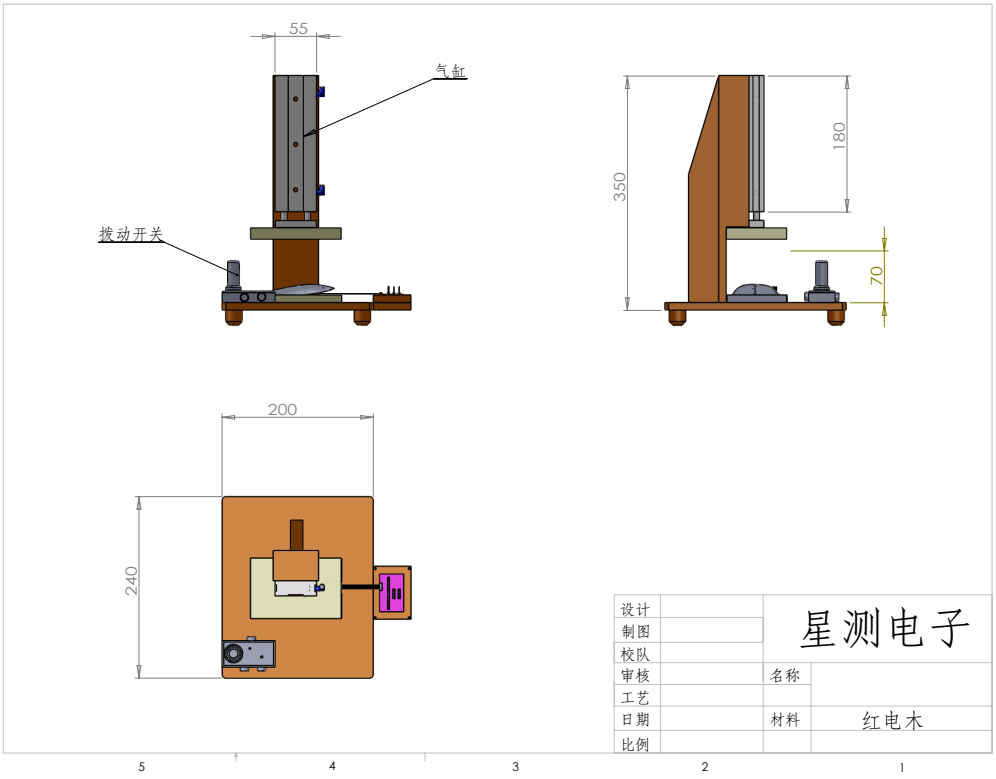


Figure 4: fixture structure