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PCN13409

Final Test in MUAR (Malaysia), EWS test in Rousset (France) & Ang Mo Kio (Singapore) - Test platform moves from HP93K to T2K with ARTEAC for STM8AL3x 32K Automotive products

Qualification Plan

05-Oct-2021

GPM Engineering, Operations & Quality

Introduction

Description of Changes / Context

- Scope: selected automotive commercial products STM8A (see the full list of impacted products in PCN document)
 - The proposed change is linked to production steps of electrical wafer sort (EWS) and final test (FT), and quality acceptance test (QA test - sometimes also called quality control or QC test) within the test and finishing flow.
 - The current 93K test platform is becoming obsolete, in order to prepare for the demise of this test platform, as well as to sustain the strong automotive demand and long term market growth, ST GPM group is changing its Electrical Wafer Sort (EWS) and Final Test (FT) production test platform for automotive products by Introducing STM8AL product family on ADVANTEST T2000 test platform that is already qualified for Automotive MCUs on ST production site. this new platform will be maintained by our suppliers for many years and ensures the same test coverage as the previous one.
 - As of today, automotive products are, after assembly, subjected first to FT tests and after that to QC test
 - All the sales types have one FT at HOT and one FT at COLD.
 - Quality acceptance test QC is performed once, typically at the end of test flow.
 - The basic idea of the change is to replace QC test by so called ARTEAC test (Automated Real Time Electrical and Audit Control) keeping the same test coverage and same lot quality acceptance criteria.
 - ARTEAC flow contains at least the same test instances as the existing QC flow (same or larger test coverage compared to QC).
 - ARTEAC execution: During the lot final test there is a real time sampling (regular intervals following an algorithm) and the selected units – after passing the FT test - will be subjected to ARTEAC flow, without any disconnection.
 - Advantage is that the ARTEAC sampled unit should not be twice contacted (ARTEAC flow executed immediately after the unit passed FT flow) and no loading of QC test is required after FT test, thus reducing quality risk induced by QC handling.
- There is no loss of test coverage or other product quality concern because ARTEAC is simultaneously done at the very last FT step within the test flow.

TEST PLATFORM MOVES – Initial Verifications

- Initial verifications check correct behaviour of test flow solution prior full qualification
- The T2K test platform in ST production sites is already used in mass production of non-automotive STM32, STM8 and other ST automotive products
- The verifications are to be done using a limited number of the impacted automotive finished goods (based on dice 79HZ) and using the T2000 test programs of interest (EWS : ST79HZ_T2KF1, ST79HZ_T2KF2, and Final Test : ST79HZ_T2KFT)

Verification	Criteria	Comment
Verification of test flow integrity	Comparison between reference flow in production with new one	Check of test program integrity
EWS and Final Test correlation	100% Matching of test result – direct matching and F2P or P2F fully explained – between both teste platform	Correct binning and physical sorting
Verification of parametrics	Correct Cp, Cpk and AIV	Aligned with GPM requirement

TEST PLATFORM MOVES EWS Qualification

- EWS1 and 2 : At least 1 wafer will be used for cross-platform correlation on production site
- 1 wafer (5738 Dice) tested in production condition will be used for this trial.
- The units are tested first with reference platform currently in production and after that with new platform.
- Criteria: behavior of both test platform should be identical/All QC fails (if any) must be detected as ARTEAC fails

Test Program Quality Validation with EWS1 Ambient Rejects

Order / Test Stage	Criteria
1. V93000 in Toa Payoh EWS1 @ ambient	<ul style="list-style-type: none"> •Pass/Fail exercise on same wafer tested on each EWS1 test platform: <ul style="list-style-type: none"> - Acceptance criteria: 100% Bin to Bin correlation (or 100% differences explained) •Parametric exercise on same wafer tested at each EWS test platform: <ul style="list-style-type: none"> - Acceptance criteria: Datalog distribution on available parametric tests 100% aligned between each test platform.
2. T2000 in Toa Payoh EWS1 @ ambient	

Test Program Quality Validation with EWS2 Hot Rejects

Order / Test Stage	Criteria
1. V93000 in Toa Payoh EWS2 @ Hot	<ul style="list-style-type: none"> •Pass/Fail exercise on same wafer tested on each EWS2 test platform: <ul style="list-style-type: none"> - Acceptance criteria: 100% Bin to Bin correlation (or 100% differences explained) •Parametric exercise on same wafer tested at each EWS test platform: <ul style="list-style-type: none"> - Acceptance criteria: Datalog distribution on available parametric tests 100% aligned between each test platform.
2. T2000 in Toa Payoh EWS2 @ Hot	

TEST PLATFORM MOVES FT Qualification

- Final Test : At least 1000 dice will be used for cross-platform correlation on production site
- The units are tested first with reference platform currently in production and after that with new platform.
- Criteria: behavior of both test platform should be identical.

Test Program Quality Validation with FT Hot Flow

Order / Test Stage	Criteria
1. V93000 in MUAR FT1/QC1 @ HOT	•Pass/Fail exercise on same parts tested on each FT1/QC1 test platform: <ul style="list-style-type: none">- Acceptance criteria: 100% Bin to Bin correlation (or 100% differences explained)
2. T2000 in MUAR FT1/Arteac @ HOT	•Parametric exercise on same wafer tested at each FT test platform: <ul style="list-style-type: none">- Acceptance criteria: Datalog distribution on available parametric tests 100% aligned between each test platform.

Test Program Quality Validation with FT2 Cold Flow

Order / Test Stage	Criteria
1. V93000 in Toa Payoh FT2 @ Cold	•Pass/Fail exercise on same wafer tested on each FT2/QC2 test platform: <ul style="list-style-type: none">- Acceptance criteria: 100% Bin to Bin correlation (or 100% differences explained)
2. T2000 in Toa Payoh FT2/Arteac @ Cold	•Parametric exercise on same wafer tested at each EWS test platform: <ul style="list-style-type: none">- Acceptance criteria: Datalog distribution on available parametric tests 100% aligned between each test platform.

ARTEAC QC Flow Qualification

- *A separated QC test program is generated, that is containing the exact same content of the 'Arteac QC' flow embedded in the production Final test program.*
- *500 random rejects from FT_Hot production are collected*
- *These parts are tested with the QC test program: Expected outcome, 2 kinds of bad parts captured by QC flow, parts with FT-fail signature, and parts showing open short defect.*
- *500 random rejects from FT_Cold production are collected*
- *These parts are tested with the QC test program: Expected outcome, 2 kinds of bad parts captured by QC flow, parts with FT-fail signature, and parts showing open short defect.*

Gage R&R

- As the production testing will use new ATE systems, we'll proceed to Gage R&R and CPM analysis for the new T2K measurement system
- The gage R&R and CPM analysis follows STM specification ADCS 0042462: "R&R AND CPM FOR MEASUREMENT SYSTEM ANALYSIS"
- To be performed on packaged parts, at 25°C ambient temperature, in ST Muar (Malaysia) manufacturing plant.

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