Automated Probe Card Exchange and Docking for RADAR Products Running at 40GHz and Beyond

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Overview

• Where is RADAR used
• How does NXP RADAR fit in to industry
• Components needed to test
• Is it ready for production
• Show me the data
• Summary of results
• Question and Answer
Where is the RADAR

• Radar use Past/Present
  – Radar was developed around the time of WWII. It has traditionally been used in a variety of military and commercial applications such as detecting aircraft, ships, guided missiles and weather formations
  – The modern uses of radar is expanding to be used in antimissile systems, flight control systems, aircraft anti-collision systems, and even geological observations

• Where does NXP fit into the RADAR space?
  – Answer: Automotive radar
NXP Chip-Sets designed to sense objects around your vehicle
NXP Radar

- NXP produces a 77GHz radar transceiver chipsets which can support the following:
  - Long-, mid- and short range functionality
  - High performance and integration capabilities
  - Multiple safety applications such as:
    - Adaptive Cruise Control (ACC)
    - Blind Spot Detection (BSD)
    - Emergency Braking
    - Forward Collision Warning (FCW)
    - Headway Alert
Parts to test

- Parts required to test product
Assembled Parts

- Parts fit together
Production Worthy?

• Is the previous picture able to be ran by production associates?

  • Answer: NO!
    – It takes an engineer/technician hours to set this up. There are too many parts/pieces which have to be correct. Production does not have time to spend hours setting up a device.

• The part has to be assembled properly with the correct components for each different device. This would be equivalent to a blueprint for testing the wafer.

• We Need a BETTER solution
Production Worthy 2nd Attempt

- Recruited some friends at NXP for our 2nd attempt at making the setup production worthy.
Production Worthy 2\textsuperscript{nd} Attempt

- The wires are now encased in a cage. The test head can be docked from the top. It was a big leap forward for the engineers setting up the tool.

- But did this solve our issue?
- Not quite.....

- The problem was to change the probe card, the cage had to be removed and all the wires detached from the probe card. It is still not ready to be ran by production associates. This process still too time consuming.
Production Worthy 3rd Attempt

• How to make a production worthy 3rd attempt?
• Recruit some friends!
• Enlisted the help of our friends at inTest Corporation and Cascade MicroTech
Proof of Concept (POC)

- Stakes are now higher so decided to build a POC before starting the production version

- Data from the loop back connections
Universal Hard Dock

FSL-MMW-UDI Probe Interface – Section View

ENCLOSURE  PIB RF COMPONENTS  BLIND MATE RF CONNECTORS  POGO BLOCK  UDI-PIB ASSEMBLY

AIR FITTING

PROBER ADAPTER PLATE  PC TRAY  WR-12 WAVEGUIDE  PROBE NEEDLE/ MEMBRANE  PROBE CARD ASSEMBLY  P-5XL BACD PROBER

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SW Test Workshop - June 5-8, 2016
Universal Hard Dock Components

- The Universal Hard Dock incorporated the following items:
  - Blind mate connections for the 77GHz and below signals
  - Pogo block for the DC and logic connections
  - PIB RF components
  - Air fitting to allow for testing at temperature other than room
  - WR-12 waveguides for connecting the probe card to the enclosure
  - UDI PIB assembly for docking the test head
Universal Hard Dock Production
Data -40C

- Test done at -40C
- Wafer splits 2,6,8,11,13, 15,19,22,23
- Wafer splits 1,4,5,9,12,16, 21,24
Universal Hard Dock Production
Data 125C

- Test done at 125C
- Wafer splits 2, 6, 8, 11, 13, 15, 19, 22, 23
- Wafer splits 1, 4, 5, 9, 12, 16, 21, 24
Universal Hard Dock Production

Data

- ICC test between systems
Summary

• Time savings of 2x for changeover between products
• Eliminate possible damage to cables, waveguides, and other RF components due to handling
• Critical parameters Pout & Icc Cpk >> 1.67
• Yields are comparable between setups
• The Universal Hard Dock allows manufacturing the ability to change the products running without engineering involvement saving time and engineering resources
Thanks for the Support!

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