RFID TAGS AND LABELS

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Introduction

- Review the components that go into a smart label.
- What makes one label different from another - other than price?
- What are the key standards?

Agenda

- CHIPS
- CHIP PREPARATION
- ANTENNA DESIGN AND MATERIALS
- TYPES OF CHIP ATTACHMENT
- LABEL PRODUCTION
- FINAL QC
- STANDARDS

Overview

- IMPACT OF COMPONENTS ON LABEL PERFORMANCE AND PRICE
- LABEL TOTAL QUALITY AWARENESS

Vocabulary

- Inlays, tags, transponders
- Smart cards
- Smart labels
- Chip fabs
- Wafers
- Chip memory (read only, write once/read many, read write)
- Anti Collision-# tag id's read per second
- Near Field and Far Field
- Tuning/detuning

STANDARDS

- HF- iso 15693 (TI, Philips, EM, Infinion)
- HF- iso 14443A and 14443B (Philips, Infinion, TI)
- UHF- iso 18000 part 6A and 6B and 6C (Philips)
- UHF- epc Gen 1 -class 0 (Symbol)
- UHF- epc Gen 1 -class 1 (Alien, KSW, Rafsec)
- UHF- 0+symbol and 0+ Impinj (Symbol, KSW)
- UHF- epc Gen 2- class 1 (Alien, TI, KSW, Rafsec, Avery - all with Impinj chip).
- Options outside the standard can be added

CHIPS

- 8 inch wafers - 15,000-50,000 chips
- Tested vs. untested Wafers-Chip Maps
- Chip startup power
- Fabless chip design (Symbol, Alien, Inpinj, Tagsys, Checkpoint, Intermec)
- Fab design houses (STM, TI, Philips, EM)
- Internal capacitance
- Wafers best case yield is 97% good chips.
- New designs- couple million $.

CHIP PREPARATION

- Cut the wafer into single chips along scribe lines.
- Thinning the wafer- microcracks
- Bumping the chip (gold/nickel, palladium, etc). 4 bumps on a chip connect to 4 connection pads on the antenna.

ANTENNA

- Tuning - (example- HF- 13.9-14.5). UHF- bandwidth.
- UHF- Orientation (how many degrees)
- Antenna film- thickness, static resistance, stretch when heated curves.
- Etched (copper and Aluminum)-hi volume.
- Conduction Inks- Silver (ok for UF- poor for HF)
- Stamped foils- durability question
- Copper Deposit- commercial timetable?
- New designs- maybe $2500 for a printed or copper deposit antenna, to $10,000 for an etched antenna or stamped.

CHIP ATTACHMENT

- Drive the chip bumps into the antenna connection pads and securely attach.
- Flip Chip (Rafsec, KSW, Smartag, Hanna, TI)
- Strap Attach with adhesive (Avery, Alien)
- Strap attach with cold weld (Omron)
- Strap attach with hot solder (Avante)
- Wire bonding
- Produced inlays quality best case is 97% good with bad ones marked.

LABEL MAKING

- LABEL- Face sheet/adhesive/ inlay/adhesive/ liner.
- Face sheet can be paper or film thermal transfer.
- Face sheet can be preprinted with graphics
- Can be in rolls (min 3 inch core) or fan folded
- CARDS- film face/adhesive/inlay/adhesive/film.
- Cards come as singles only.
- Cards can use films to be either thermal transfer printed, dye sub printed, thermal re-transfer print.
- Best case is an inlay yield loss of 1-3% in label making.

QUALITY TESTING

- Can be prior to label making or after label making.
- Can be dead/alive read test or a write test, or a read distance test.
- Bad ones can be counted/reported or marked or removed or removed/replaced.
- Capacity constraint.
- 100% good labels are costly. Consider your real quality requirements given the printer you use will find bad ones.
- Shipping packaging is important. Smart Cards are very sensitive!

SUMMARY

Key Questions

- What standard?
- What chip?
- What antenna material and film characteristics?
- Antenna tuned for what materials?
- Type of chip attachment?
- Type of QC tests done?
- Reaction to QC tests?
- Is quality warranty as shipped or as received?